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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

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Safety of Retail Credit Structure Must Be Guarded Zealously

Sound time payments form basis upon which automotive business has been built. Car makers have definite interest in methods used in handling buyers' notes.

By James Dalton

WHENEVER production of any commodity overtakes and then passes demand, various expedients are adopted to force sales. One of the most common is to make price concessions and another is to grant credit terms which should be classed as highly speculative.

If a market is steadily shrinking, and if a large amount of capital is tied up in finished products, the sacrifice of profits by reducing the cost to the consumer not only is justifiable, but frequently is dictated by business prudence.

The granting of extravagant credit terms to carelessly scanned credit risks never is justified, however, under any conditions either in good times or bad, because heavy losses will be inevitable.

Yet that is exactly what is being done today by many automobile dealers, and if manufacturers are not exactly fostering the dangerous practice they certainly are not frowning upon it very severely.

It may be contended that motor car dealers themselves don't extend credits of any kind, much less those which involve ridiculously long terms and negligible down payments. They don't, but they operate through finance companies which do.

WITH sales slipping, dealers are finding more and more irksome the terms of the strong, conservative, well-managed finance corporations, which examine credit risks carefully, give only twelve months' time and insist upon a down payment of 33 per cent.

Unfortunately, they are not dependent for accommodation at this juncture upon concerns which are operated upon sound banking principles. There have sprung up like mushrooms in the last three years a crop of finance companies of a new type, which accept retail paper without dealer indorsement, pay scant attention to the responsibility of the purchaser, give almost any length of time in which to complete payments, and accept much less than 33 per cent as a down payment. Their fees are lower than those of the older and more conservative companies, because most of them do only a local business, their organizations are small, they have few credit investigators, and they have not surrounded themselves with insurance of all kinds against loss.

THEY are in direct competition with the old-line houses which look up carefully the responsibility of every would-be purchaser, which give only a year's time in which to complete payments, and which insist upon the payment of one-third down, regardless of conditions. Most of these companies also demand the dealer's indorsement on purchasers' paper, which makes him responsible to the finance company for the balance due if the buyer defaults. In other words, they are conducted along sound business lines.

The shortsighted dealer may consider these old and strong companies a bit arbitrary now and then, and he may take the position that he should worry what kind of terms are acceptable to the finance company inasmuch as he assumes no responsibility for the purchaser and gets his commission. In a good many cases of late the down payment hasn't even paid the commission in full.

When business is brisk, with demand equaling or exceeding supply, as it did last year, the methods of financing time sales may make little difference with the dealer, because no such condition can exist unless business in general is running at full tide, with employment plentiful, wages generous and purchasing power high. This was the situation in 1923, when the sales volume of the automotive industry established a new high level. Under such circumstances there need be little fear that installment buyers will fail to meet their payments.

At a time when business in almost all lines is gradually falling off, however, as it is today, slovenly time sales methods constitute the greatest menace to the entire automotive industry. Illegitimate chickens come home to roost when sales volume shrinks. Here are the steps which lead in a vicious circle:

The Business Circle

1. Installment buyers, with their earning capacity reduced, find themselves unable to buy the necessities of life and at the same time keep up payments on their car.
2. Finance companies operating on the "no recourse" plan, that is, without having the dealer's indorsement on the purchaser's paper, repossess the car on which payments are in default.
3. The finance company has no machinery for the reconditioning or resale of these cars and throws them on the market for whatever they will bring, because, to save their own skins, they must get out of them immediately all the cash they can.
4. Prospective purchasers both of new and used cars find they can buy a repossessed car for little or nothing and they "take a chance," frequently to their sorrow, because they get no guarantee whatever.
5. The dealer finds the used car market glutted and he can't get rid of those on hand in which he has tied up considerable of his capital.
6. When the dealer can't move used cars, he can't trade with potential buyers of new cars.
7. When the dealer can't trade, he can't sell new merchandise.
8. When the dealer has no market, he can't buy from the manufacturer.
9. When the manufacturer can't sell to the dealer, he must curtail production sharply or even close his factory.
10. When sales of new cars are checked, the revenue of finance companies is shut off and those which are not strong financially must fail.
11. When the unsoundly managed finance companies with low rates have financial difficulties, the banks shut down on their credits.
12. Then, when the dealer does make a sale, he must go to the sound, well-managed finance company, which he once thought arbitrary, to get the accommodation he requires.

Parts Makers in Strong Position

The only persons in the industry who are not likely to be adversely affected are those who sell replacement parts and equipment.

Manufacturers who have been more or less indifferent to the methods of financing employed by their dealers so long as they sold cars, will find that they are more directly concerned than they realized. They long took the position that the used car was exclusively a dealer problem, but they found it wasn't, for the simple reason that when dealers have a considerable portion of their liquid capital frozen in second-hand merchandise which they can't move, they are not in a position to pay cash for new cars.

Anything which tends to complicate seriously the used car situation will inevitably react upon the manufacturers by reducing their sales outlets and forcing them to curtail production.

Virtually all factories are agreed that they must give their retail sales organizations constructive instruction in sound business methods, and there is no phase of their work in which they need education more than in sane methods of financing time sales.

Installment Plans Sound

The principles upon which installment sales of automobiles are built are thoroughly sound, but the business has attained such enormous proportions that it is being subjected to the most severe scrutiny and criticism. Everyone in the industry is familiar with the campaign of denunciation launched months ago by clothing and other interests which have had an unsatisfactory sales volume. Economists and statisticians also are viewing with alarm the giant credit structure which has been reared and they do not hesitate to say frankly that if any large part of it collapses the results will be serious.

While the propaganda campaign is vicious and more or less harmful, it is founded upon selfish self-interest and therefore need cause little fear, but if the warnings and forebodings of disinterested economists prove even partly accurate, a hard blow will have been struck at the whole time payment system, for it will have supplied the propagandists and the enemies of the automotive industry with a whole arsenal full of high explosives. Many thousands of persons who now are contemplating the purchase of cars on time will be frightened out of the purpose and many thousands more who have had their cars repossessed after they had been partly paid for will have to defer automobile buying for a long time.

Possible effects of such a situation are not difficult to assess. The ease with which automobiles could be purchased in time has been responsible more than any other single factor for the astounding success of the industry. It is highly doubtful if more than a third of the cars now in use would have been in operation if retail sales were made only on a cash basis. Common sense would seem to require, therefore, that the installment business should be kept upon a solid foundation.

Time Sales Necessary

Eight new automobiles out of every ten sold are being bought on time and the same is true of a very large percentage of the used cars which are handled by dealers. It is absolutely essential to permanent success that this business should be kept on a high plane. Fundamentally, it is just as sound as any phase of banking.

Over a long period, Americans have been acquiring the time payment habit. Many of them have found that in this way they can acquire the comforts and luxuries to which our high living standards entitle them, without encroaching upon their savings, simply by making regular payments of moderate amounts. They have an inalienable right to spend their own money for whatever seems to them most desirable.

Merchants who grant these credits will be foolhardy indeed, however, if the sum involved exceeds a conservative estimate of the purchaser's ability to pay. The strength and weakness of the time payment system rests almost exclusively upon the question of credit risks. Without credit the business fabric of the nation would collapse, but it is equally true that a top-heavy credit structure also will collapse.

Even those finance companies which operate on a "no recourse" basis are taking relatively few chances if they investigate carefully the credit character of

their prospective patrons and positively refuse to extend accommodation to those who seek unduly liberal terms or who obviously are trying to buy out of their logical price class.

It is quite probable, for example, that a family without children, with a steady income of $75 a week, might afford a car costing around $1,000, while a family with one child and the same income might not, although it could afford a car costing $500 or less. If there are two children, on the other hand, they might aspire only to a used car in the lowest price class. There are comparatively few families who cannot keep up their payments on some type of automobile.

The ability and inclination of a person to pay are the only considerations in granting credits. The finance company should learn whether the prospective purchaser has a good credit standing with other persons with whom he has dealt on a time basis. If he hasn't, the granting of credit is not justified. There almost always is some kind of a check on this question, although there are many persons who have no credit rating because they always operate on a cash basis with tradesmen and such persons usually are good credit risks.

This is only a small part of the information which the efficiently managed finance company demands in every case before it will make a loan. Getting it and not getting it makes all the difference in the world. The company which has it is traveling in broad daylight along a wide, open highway, while the company which hasn't is stumbling along in the darkness over a plowed field full of pitfalls.

MERCANTILE ACCEPTANCE CORPORATION

Purchaser's Statement

To.....
(Name of Dealer)

Dated at.....192.....

For the purpose of securing credit from you and Mercantile Acceptance Corporation in connection with my purchase of a.....automobile for $....., of which $..... is paid on account, and the balance in.....installments, I make the following representations:

Full Name.....Age.....Married?.....No. of Dependents.....
Residence.....City.....Phone No.....
Landlord.....Residence.....Phone No.....
Address where car will be kept.....
Car will be used for pleasure.....Business.....Will car be used for hire?.....
IF USED CAR, state: Year.....Model.....Serial No.....Motor No.....
Occupation.....Company name.....Dept.....
Address.....Phone No.....Salary.....How long employed.....
Previous occupation.....Company name.....Dept.....
Address.....Phone No.....Salary.....How long employed.....
Have you bought a car on time before?.....If so, what company carried the note?.....
Checking account with.....Bank.....Branch
Savings account with.....Bank.....Branch

Trade references (with whom BUSINESS HAS BEEN TRANSACTED RECENTLY)

	Name	Address	Phone
1.			
2.			
3.			
4.			

Own real estate as follows:

Location	Cost	Present Value	Mortgage
	$	$	$
	$	$	$

Additional sources of revenue from which I expect to make payment of balance of purchase price are as follows:
Cash on Hand.....
Additional income and source:.....
Remarks:.....

(Signed).....
(Purchaser)

Facsimile of form used by one finance company in gathering credit information

The least substantial companies are the most careless and indifferent in making loans. Their costs are low and they can earn a substantial profit while at the same time giving lower rates than the more conservative houses when business is good. It is difficult to understand, however, how any one with even a rudimentary knowledge of banking practice can hope to escape disaster without the adoption of greater safeguards than they use.

Finance Companies Spring Up Rapidly

When the boom in automobile sales got well under way early in 1922 new finance companies began springing up in every large city and even in many smaller places. These local concerns did business only in their home towns and they did not require the elaborate organizations which are necessary for the larger companies operating on a national basis. Many of them were backed by men who had no previous experience in financing automobile time sales. They interested a few friends and got together from $50,000 to $100,000 as capital with which to establish borrowing lines at banks.

The terms they were able to offer dealers were so easy and attractive that they had no difficulty in building up a considerable volume of business and as payments were made by customers the money was immediately re-invested so the original capital really constituted a sort of revolving fund.

Hard Times Test Stability

As long as automobile sales are good and collections easy, these companies will get by and make a substantial profit, but it is inevitable that some of them will fail when the pinch comes; and once a few of them have been unable to make good their bank loans the banks will shut down on credits to all except those which are well known and which have abundant resources of their own. Finance companies will be blacklisted by bankers and the funds with which to finance automobile time sales will shrink sharply.

This will mean that it will be much less easy to buy a car. The only source of loans then will be the old, solidly established, well-managed concerns. They are the ones which always have scanned credit risks closely, but which began to scan them even more closely last summer when motor car sales were at the peak, on the theory that business would shrink sooner or later and that when it did they wanted to be sure of the payments which would be falling due then. Time has demonstrated the wisdom of their course, for sales undeniably have fallen off and the volume of business in all lines is slowly contracting so that there probably will be considerable unemployment and consequently less buying power.

It should not be assumed that there has been an alarming increase in the number of automobile buyers who have failed to meet their installments for there has not been. The percentage of losses ranges from one-tenth to one-quarter of 1 per cent on the total of business except in the cases of some "no recourse" companies which have not watched their credits carefully.

No one, it has been demonstrated, will let his car payments lapse unless it becomes absolutely necessary, "but needs must when the devil drives."

"An enormous volume of retail business is being done on the deferred payment plan. Many thousands of buyers who have bought cars on this basis can meet their notes promptly as long as there is no shrinkage in their present earning capacity, but if there should be unemployment on a large scale or any material decrease in wages and salaries, a large proportion of them would have to default.

"In such an event the finance companies would have

(*Continued on page* 917)

When Should Old Machine Equipment Be Replaced?

Obsolescence is an important factor in automotive field. Speed is being combined with accuracy more successfully each year. Maintenance studied carefully.

By W. L. Carver

THIS article gives to the general executive an interesting picture of what factors are influencing machine tool buying in factories other than his own. It provides for the production man specific details about how other engineers are handling problems common to every plant. It indicates for the machine tool builder what the automotive industry expects in future tool development.

Here is an analysis which should provide useful ideas for nearly every automotive executive.

IN the quest of higher production and greater accuracy combined with reduced unit costs, the production side of the automotive industry has developed certain general standards of maintenance and repair of machine tools along with similar theories of replacement and obsolescence. Machine tools, jigs and fixtures as a whole require maintenance and repair to preserve the relation and accuracy of their working surfaces. From time to time some of this equipment proves to be fundamentally deficient in these characteristics and is replaced by units which are more advanced in these respects.

As the game progresses, somebody's broader vision evolves a combination of mechanical elements which approaches the job in an entirely different, usually a more fundamental, manner and sets up new standards of production and accuracy, with the result that the former equipment is automatically made obsolete.

Wasteful Replacement Being Wiped Out

From a practical standpoint, the points at which replacement should take the place of repair and at which obsolescence takes the place of both are not closely defined. Each individual case is bound up with the affairs of the individual company. However, a bird's-eye view of general tendencies along the machinery and equipment lines can be made by comparing the high-production shop of fifteen years ago with the plant of today. At that time the automotive shop was just throwing off its general purpose shop characteristics and turning toward specialized methods and equipment. The road of specialization has not been at all smooth and the aggregate picture of the automotive shop has varied several times to correspond with the ideas of the moment.

As in the case of all other forms of national activity, the war period complicated the equipment problem and served to destroy temporarily the perspective which is a basic part of all normal development. In addition to this, the curve of the industry's growth shows that expansion was extremely rapid up until very recently. These influences precipitated decisions regarding equipment and methods and led many automotive and machine tool builders into false standards of maintenance, replacement and obsolescence. At present, war-time influences having disappeared to a large extent, the industry is entering into the long haul of commodity competition, with the result that policies concerning machinery and equipment are getting down to a sound economic basis. Instead of throwing equipment into the junk pile just because it is two or three years of age, the production engineer is analyzing his problems and cutting his suit of equipment to fit his cloth of requirements.

Segregation of these problems of machinery, tools and equipment is not simple, as each phase is intimately related to all others. Therefore to simplify the treatment of the aggregate picture, discussion will begin with the factor of obsolescence and work back through replacement and finally maintenance and repair. One manufacturer defines a machine as obsolete "when developments and improvements on the part of machine tool manufacturers make it imperative that we discard old equipment in favor of the newer types." This statement probably crystallizes the fundamental thought of the entire industry and provides the complete answer to all questions of obsolescence and machine tool life and incidentally puts the problem squarely up to the machine tool builders. By it, their market is established, a market in which demonstration or proof of principle is the convincing, closing sales argument.

Even the most casual analysis of the above definition of obsolescence will reveal that no attempt is made at dictating any form or trend of design. The whole definition is hinged upon the service which the machine will render. Whether the machine is hand operated or automatic, has one head or a dozen, is only incidental to its ability to produce operations of the requisite standard of accuracy at a rate which is attractive as compared to conventional processes.

Demand Quantity Production, Plus Decision

Accuracy and its continued maintenance have become primary factors in the consideration of any new machinery and equipment.

Two basic reasons contribute to this consideration: First, the transition from the bulky, inefficient powerplants of fifteen years ago to the smaller, more efficient units of today has necessitated a more accurate disposition of material and better fits. Second, practically all manufacturers have their ideas of the relationship of quality or accuracy to quantity or production straightened

out. No matter how limited or how great the quantity or how cheap the car, a consistent rate of production that approaches the anticipated schedule is absolutely dependent upon a consistent standard of quality or accuracy.

General appreciation of the second point is borne out by several types of machine that now are replacing and making obsolete machines which formerly were regarded very highly. These may be called machines of cyclic operation in which loading, unloading and maintenance of cutting surfaces are the chief functions of the operator, who has nothing to do with the rate of feed or the dwell of the final finishing cut. In most cases, the cam feed features of the automatic machine are utilized to produce these results. Disregarding the higher production rates that are attendant with this type of machine, a basic reason for the improvement or maintenance of accuracy exists in the design of these machines.

When production is being crowded, the spectacle of an operator laying on a drill press feed lever, the hand wheel of a lathe carriage or milling machine is a common sight. The cut is rushed up to the stop on the machine and instantly backed off so that a new piece may be put into the machine, and when these parts are inspected the element of consistent accuracy is missing.

Engineers Allow for Deflection

Then the other side of the same picture: Engineers and those in touch with the development of the art have known for a long time that no matter how small the load imposed on material of any kind, a proportionate deflection is set up. The deflection of a 4-in. square bar of steel under the weight of an ordinary housefly has been measured definitely. Machine elements are subject to the same laws of deflection under load. When the operator crowded the hand feed machine, part was overloaded and consequently deflected, no dwell at the finish stop was allowed for all of the elements to approach the normal relationship of the set-up; therefore, the product varied.

While the basic requisite is, in shop parlance, more beef or better disposition of more rigid sections, the general tendency in machine tool design has been in this direction for several years. However, the cam feed or cyclic machine as typified by recent developments embodies these features in conjunction with the inherent characteristics of a cam which permits a dwell at the finished position that allows all of the elements of the machine to come to their normal relationship.

Within the past year several machines of this type have been described in the columns of AUTOMOTIVE INDUSTRIES. Among them may be included the Meldrum-Gabrielson Production Unit, Osterholm grinder, the Cincinnati Shaper Co.'s gear hobber which substitutes a screw and gear combination for the cam, Gisholt Simplimatic and the Bullard Contin-u-matic, which augments the Mult-au-matic, an earlier development of the cyclic type. Variations of the same principle are applied in the Fellows gear grinder and thread generator as in practically all machines of these two types. The wide range of operations covered by these machines, it may be predicted, will shortly be supplemented by several developments of a similar nature which are applicable to entirely different types of operations.

The most recent development of this type of machine is the eight-head hobbing machine made by Sommer & Adams of Cleveland, Ohio. The eight heads all are mounted on a central carriage which is supported by a ball thrust bearing from the combined base and pivot. The carriage is driven by a pinion and internal gear arrangement from a cross shaft and changeable reduction gears in the base. A large ring cam which is mounted on the base is proportioned so that one station is allowed for loading and unloading and the head is then advanced rapidly to the point of the hob's contact with the end of the shaft.

The cam then moves the head gradually upward but at high rate of feed until the full length of the cut is obtained, at which point there is a slight dwell that allows all of the splines to finish out evenly, and finally lowers the head rapidly to the loading position. Standard double row ball bearings which act as rollers in contact with the cam are at the lower ends of two heads.

One of these machines is already in operation at the Adams Axle Plant at Findlay, Ohio, and is showing a production of 1200 ten-spline shafts per day. Chatter marks on the finished surfaces are eliminated by the positive nature of the cam feed mechanism.

Design Improvements Decrease Market

Innovations of the types listed above provide the final answer to the question of machine tool life in the automotive production line. They also point out the reason why some machine tool builders are prospering in a period of apparent over-capacity. Like the motor car field, as long as someone can produce new developments which are real basic developments, there is no saturation point. People everywhere in every line of activity will take up the new thing which reduces human effort and produces more of the desired service with the natural result of reduced cost. New basic developments step out of the scramble of the purely replacement field because they make the equipment already in use obsolete for a specific purpose. If, in conjunction with developments of similar nature, the shoemaker would stick to his last instead of following after the tailor, a lot of the problems of the machine tool builder and automotive manufacturer would be solved.

Outstanding developments which make existing equipment or processes obsolete rise out of the usual replacement field, although they must be regarded as an economic portion of that field. Developments of this kind serve to make the economic issue rather clear cut, the decision being based on demonstration of the machine's ability to pay its own way within a reasonable period. The wartime orgy of replacement has disappeared into an era of cold-blooded calculation of capital investment, returns and profit, with emphasis on the profit feature. Analysis of this nature has developed what might be termed a composite formula which involves all of the terms of obsolescence which have already been discussed—replacement, maintenance and repair.

> Franklin replaces a machine when the annual repair bill amounts to twenty per cent of the original cost or when a new type will show a saving of the sum invested within two years.

Franklin crystallizes their policy as follows:

"Ordinarily a machine is replaced (*a*) when its annual maintenance cost reaches one-fifth of its initial cost, or (*b*) when a new type of machine can be installed which will return its investment in saving in two years or less. Our policy in reference to replacement is, first, the replacement of only such machines as throw an excessive burden of maintenance on our machine repair department. Second, the replacement of any machine which by actual demonstration of a new type can be shown to be definitely outclassed from a production standpoint. In general, we do not make extensive replacements of machine groups simply because a new type of machine can be shown to be

somewhat more efficient, but rather attempt to pick new equipment which shows by actual demonstration over a considerable period that it is much more efficient than the machines to be replaced."

Along the same line Packard states:

"Our general policy in the selection of replacement equipment is to unhesitatingly purchase any single machine or battery of machines when all the factors involved in the computation of manufacturing costs show that the installation of the new equipment will pay for itself within a reasonable length of time through its greater efficiency."

In getting down to the purely replacement field in which a machine is supplanted by one of a similar function, the question is largely one of detailed improvement and refinement and usually, from the production department's angle, one of fitting a machine of sufficient capacity to the specific job. In the past a majority of replacements were brought about by this latter point chiefly as the result of too economical buying which scheduled work over a machine that was about one size under requirements. Nevertheless, this tendency has disappeared entirely from the better organized plants and machines are purchased on an oversize basis in order to take advantage of bigger bearings, heavier spindles, etc., from the maintenance angle.

Packard recently made a slight change in the design of a connecting rod which, with comparatively inexpensive improvements in the forging process, did away with one entire line of machine tool equipment.

Lubrication also is an important factor in the replacement field. Automotive engineering has stressed this point along with several others, such as hardened and ground shafts, hardened gears, anti-friction bearings and rigidity of structure. Consequently this information is reflected in the requirements of the automotive machine tool buyer. He now looks for the oil pump on the new machine and traces the oil supply line to satisfy himself that every working surface will be lubricated. In this process of inspection and comparison with automotive engineering standards he also checks over the other provisions for maintaining accuracy over long periods of working life. Practically every new development of the cyclic type incorporates these requirements, as do many of the units which are important in the replacement field.

Gives Reasons for Individual Electric Drive

The individual electric drive is becoming a more important factor in the replacement field, although the cost of the installation is preventing wider adoption. Nevertheless this type of drive presents some advantages that appeal to the manufacturer, particularly when the machine is intended for use in a production line that may have to be adapted later to another model. Another advantage which makes an appeal to many manufacturers is the improved lighting characteristics of the shop. Removing the overhead work may make the difference between a bright and a dismal shop. One manufacturer sums up the advantages of this type of drive as follows:

1. The absence of all expensive overhead work.
2. The ease of re-arranging machinery, which is an absolute necessity in the average automobile shop of today where the departments are continuously in process of rearrangement.
3. The lower maintenance cost of keeping walls and ceilings properly painted.
4. The possibility of maintaining better lighting facilities.
5. The ability to make the power input of the machine sufficient for its operation under the maximum conditions, rather than being dependent upon the amount of power which can be transmitted by a belt.

Another factor which is becoming apparent in the replacement field is the trend toward greater simplicity. This trend is an outgrowth of the increasing attention which is being devoted throughout the industry to the study of the fundamentals of material and its treatment. Most of the production executives of the present day have passed through the period of extreme specialization and through personal experience or observation have acquired a well developed distaste for the reactions that occur when the engineering department changes the design of the product for which individual equipment was purchased.

The trend is now all in the other direction and is making its influence felt in the engineering department. New units are designed with the punch press, drill press and automatic screw machine in mind and it is safe to predict that in the near future another of the major units of the powerplant will be added to this classification. In this connection, electric and gas welding will play a part of greater importance as developments continue.

Tendency Toward Simplification

In a slightly different manner the trend toward simplification may be illustrated by two or three examples. Not all of these fall within the replacement field, but all serve to show the trend of automotive production and engineering thought of the present day. Recently the Packard Motor Car Co. made a slight change in the design of a connecting rod which, in conjunction with some comparatively inexpensive improvements in the forging process, eliminated an entire line of machine tool equipment. Formerly Olds roughed their valve stem guides in an automatic machine and then hand reamed the hole, with a final operation of sizing the outside on a wet grinder. Now the castings are passed through a centerless grinder to rough the outside and are also ground to length in a double disc grinder. The blanks are then hopper-fed into a more accurate automatic machine for the internal roughing operation and all of the outside operations, being turned instead of ground to size. Although the second method may appear more complicated, it saves considerable hand labor both in the machine shop and assembly line. The turned finish lends itself to the operation of pressing the guides into the cylinder block to better advantage than the former ground finish.

The machine tool builder can render some service to the automotive manufacturer by devoting increased attention to the question of tools and tool holders and thereby develop a replacement market for this class of material. One automotive parts manufacturer, referring to automatic and semi-automatic machines, recently expressed his thought in this direction as follows: "The machines are fine and I can get the calculated rate of production off of them while they are under way. But if we run into hard castings and wreck the tools, the job of setting-up again is a terror. Most of the tool holders are held in place by a couple of set screws at right angles to each other. The shanks get chewed up after a few set-ups and then it takes a real artist to adjust the tool so that it will cut within ten-thousandths of what we want. Why don't these machine tool builders put some real adjustable tool holders on their stuff so that if the set-up man finds he is a little bit off he can shift the tool over to the desired point and lock it there? If a fellow came along with some

equipment like that, I would take it away from him."

What becomes of all the machine tools that have been built? A good standard machine tool does not wear out but rather is outclassed and finds its way into slower company. From the automotive manufacturer's standpoint, the problem therefore becomes one of buying equipment adequate for the class of work and then keeping it up by an adequate maintenance program. Some of the equipment will be discarded from time to time for newer improvements but the balance will remain a profitable investment just as long as it can be kept in good condition at a reasonable cost. The dividing line between maintenance and replacement is rather elusive and depends upon the individual installation and its fitness for the work at hand. For the purpose of broad application repairs may be considered as belonging in the maintenance group.

As stated previously, Franklin draws the line when the annual maintenance cost reaches one-fifth of its original cost. This statement is supplemented by the following:

"Ordinarily we are willing to spend a considerable amount of money in extensive repair to machines where there would be a necessarily high investment in new machines which would not be any greater producers than the repaired machines. The age of the machine and the value at which it is carried in our accounting department largely determine whether it should be repaired or replaced. In general, we find that carefully made repairs or complete overhauling on certain types of machines put them in exactly as good shape as new machines costing several times what the overhauling would cost.

"To maintain the accuracy and continued operation of our machines, expert repairmen are assigned to each of the machine departments in sufficient numbers to anticipate serious breakdowns by keeping the machines in uniformly good condition. When a machine has reached the stage at which the floor repair man cannot keep it in efficient operation, it is sent to the machine repair department for a thorough rebuilding."

Proper Maintenance Essential

Although subject to minor variations in each plant, this policy is typical of the entire industry. Maintenance of this type conserves the assets of the organization by practically restoring a depreciated article to its new market value. More important than that factor, it tends to keep the wheels turning according to schedule, which is the most important function of any manufacturing or sales policy or method. Just as shop accuracy has come into general demand as a means of promoting a smooth flow through the assembly department, so should the maintenance department insure smooth production in the shop.

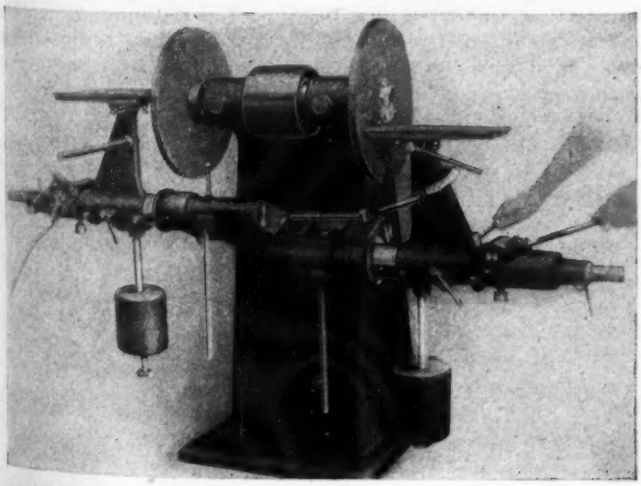
In fact, it is the last point which is responsible for the thought that production men have given to the relative values of the entire machine tool program. As the industry continues to settle down to a more truly economic conception of its place in human affairs, values of each of its factors begin to take their proper relative importance. This being the case, machine tools will be thrown out only when they are no longer economically profitable. Until someone comes along with an improved way of removing metal in the few possible basic ways, the equipment on hand will be conserved. Obsolescence, replacement and repairs or maintenance are all bound up in one package of economic expediency.

Special Mechanism Raises Table on New Disk Grinder

A NEW design of disk grinder has been developed by the Carpenter Engineering & Machine Co. of Minneapolis and is now ready for the market in two sizes, 18 and 20 in. Other sizes are to follow later.

One of the special features of this machine is the table raising and lowering mechanism. It is claimed that the operator can adjust the table to any desired elevation without wrenches or other tools, within three seconds' time, without exposing any of the finished or wearing surfaces to grit or glue and without the necessity of readjusting the weight.

The table feed is unique in that instead of the table being advanced toward the disk independently of the arm or carriage, these parts are both advanced together along the stud upon which the table carriage oscillates.



Carpenter disk grinder

The spindle of the machine is 2⅛ in. in diameter and revolves in annular ball bearings at a speed of 1800 r.p.m. End thrust is taken care of by a ball thrust bearing which can be readily adjusted for wear. Lubrication of the feed mechanism is taken care of by grease cups, and to avoid the possibility of dust entering the forward end of the carriage it is made to telescope within the bracket.

The feed lever can be quickly adjusted from the horizontal position for emery ring wheel grinding to the vertical position for light disk grinding. Clamping of the carriage and of the micrometer also are quick operations. The machine weighs 1500 lb.

DURING the past month power loss tests have been made on balloon tires at the Bureau of Standards. Some of the tire tests were of special design, one make, for instance, having the cords tangent to the rim while in another they lie at 90 deg. to the rim. In the latter case two plies only of cord are used, instead of four to six. The question of a proper endurance test for balloon tires is being investigated with special reference as to whether large cleats should be employed on the drum of the endurance machine inasmuch as these tires are designed to operate at greater deflections. The results of completed endurance tests on two balloon tires indicate that the mileage will be about the same as for the high pressure type.

Unusual Body Design of Bignan Sport Car Permits Increased Speed

New type characterized by special streamlining. Constructed to provide additional comfort and economy. Likely to be used in stock car races. Seats mounted directly on chassis frame.

AN increase in speed from 56 to 71 m.p.h. is claimed to have been obtained by the fitting of a special streamlined phaeton to a 122 cu. in. Bignan chassis. The first trials were made with an open test body and ballast equivalent to four passengers, when the engine speed could not be got beyond 2800 r.p.m., although the engine developed its maximum power on the bench at 3500 r.p.m. When the special streamline body was fitted, no changes having been made in the engine or chassis, the engine speed could be increased to that corresponding to maximum power and the car speed jumped to 71 m.p.h.

The body in question was designed by Paul Forostovsky, Jr., a Danish engineer, and is an attempt to provide additional comfort with all the economy advantages of perfect streamlining. This type of body has been taken up by the Bignan company and careful experiments are being continued with a view to determining just how far it is superior to a normal body in speed, gasoline consumption and tire wear. Probably it will be used by them in stock car races.

In the Forostovsky design, which has a certain external resemblance to the Rumpler, the chassis is not changed in any way, and the body can be built on any normal chassis. To get the best form, the radiator is enclosed under the hood, the rear wheels are inside the tail, and the running boards are put inside the body, as a result of which the width of the rear seat is increased to 60 in., or only slightly less than the overall width of the car. This additional width gives a very roomy car, and makes it possible to easily carry three persons abreast on the rear seat, with additional leg room on the running boards for the two outer passengers. There is also the advantage that the running boards can be made use of for carrying suit cases inside the car and consequently completely protected from dust and mud.

Unusual Hood Type Used

The V-section hood, covering the engine, the radiator and the headlights, is mounted on rails and can be run forward to give access to the engine. There are vertical louvres at the front which tend to direct air through the radiator, and a gap between the bottom of the hood and the front apron through which air is admitted. On each side of the hood, immediately above the front wheel, is a surface modelled on a thick section airplane wing with an opening in the entering edge for the passage of the headlight rays; this opening also admits air to the radiator. Two other surfaces are mounted, one on each side, behind the wheel, on the level of the frame members. This method of mudguarding has been tried by other firms in Europe and has been found as effective as fenders surrounding the wheels.

The seats in the single compartment body are mounted directly on the chassis frame members, with shallow wells on each side of the propeller shaft housing for the legs of the passengers, thus bringing the center of gravity very low. The two independent front seats are pivoted on a transverse rail, to facilitate reaching the rear seat, and can slide laterally and be adjusted in a fore and aft direction. There is one door on each side, and this, having a width of 30 in. and giving admission to the internal running board, affords a very easy entrance to the car. By reason of the low position of the rear passengers, it is found that a single wind screen in front affords adequate protection for all persons aboard the car.

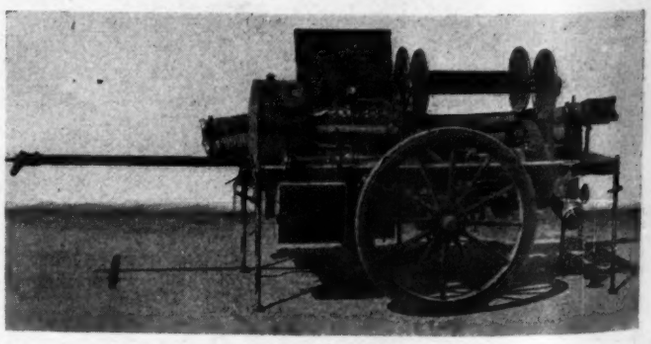
Tail Encloses Rear Wheels

The tail, which encloses the rear wheels, the gasoline tank and the spare wheel carrier mounted on the top of the tank, is hinged and attached by four clips, and on being raised gives complete access to the whole of the rear end of the chassis. All the under portion of the car is streamlined by a sheet metal pan spreading from the apron enclosing the front dumb iron and linking up with the extremity of the hinged tail; thus the only exposed parts are the extremities of the front axle outside the spring pads and the two front wheels.

While having a bulky appearance, particularly when seen from the rear, it is claimed that this construction is light, for, as all the load is carried directly on the chassis members, a wood frame with sheet aluminum covering is sufficient. In running order the car weighs 2998 lb., the chassis alone weighing 2292 lb. and the body, fittings and tools 766 lb.

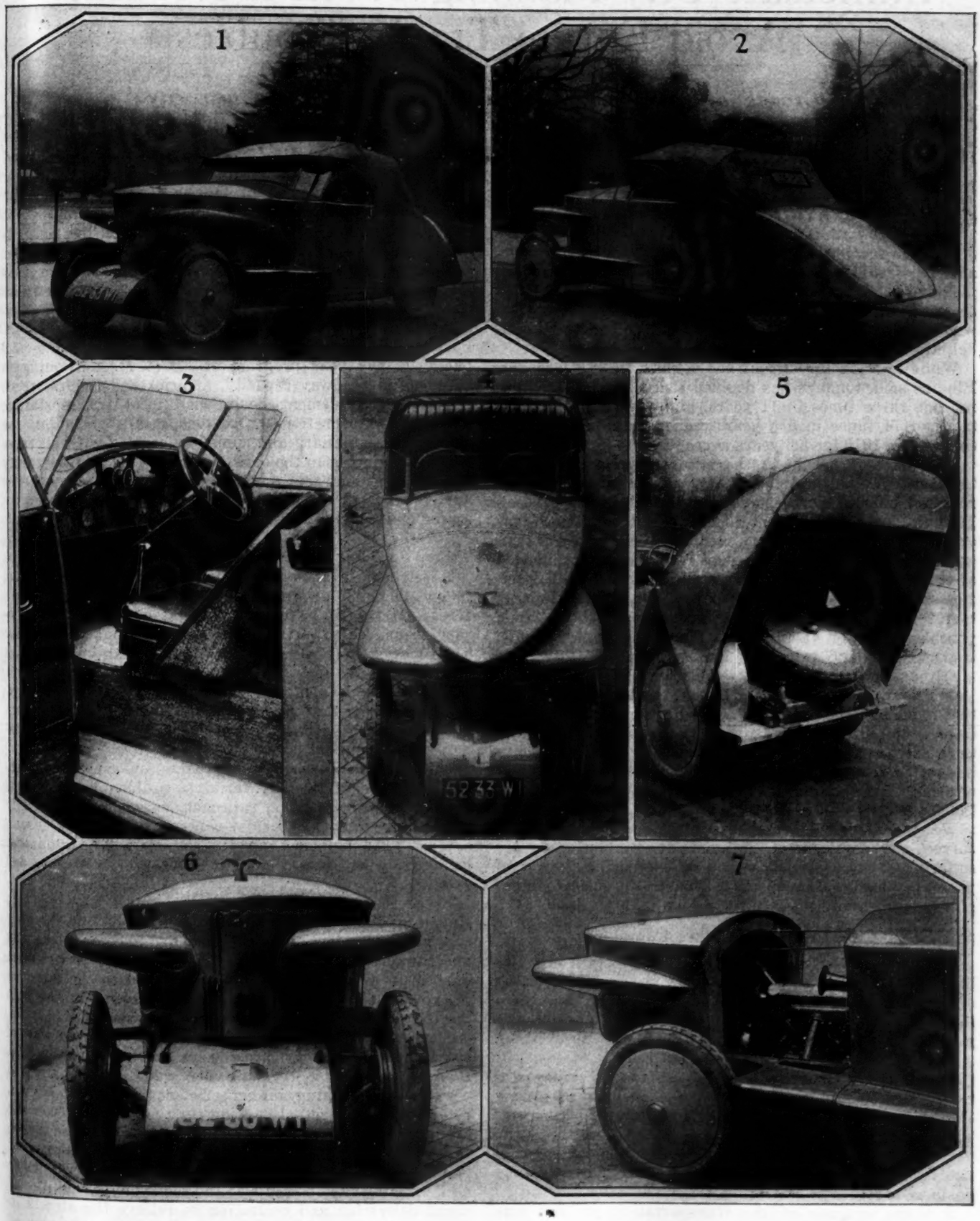
Fire Pump Uses Automobile Engine

FOR rural districts, factories, etc., where a small fire fighting outfit is required, Benz & Co. of Mannheim has developed the outfit shown in the accompanying illustration. It is a two-wheeled affair and can be moved either by hand or by coupling it to a horse vehicle, automobile, etc. The pump, which is of the three-stage centrifugal type and is combined with an air pump for use in starting, is driven by means of a 20-hp. automobile engine mounted directly behind the gasoline tank, which latter is shaped like and occupies the usual position of the radiator.



Benz wheeled fire pump comprising an automobile engine and three-stage centrifugal pump

Bignan Sport Car Has Novel Body Design



1—Forostosky streamline phaeton.
2—Hinged tail encloses gas tank, rear axle and spare wheels.
3—Runningboard is inside body and seats are mounted directly on chassis members.
4—Overhead front view showing wide rear seats.
5—View showing hinged tail in raised position.
6—Head-on view of Forostosky body.
7—Hood can be run forward to give access to engine.

Immediate City Planning Work Is Needed to Avoid Future Traffic Troubles

Growth of cities must be anticipated in laying out new city areas. Analysis of vehicular traffic should precede attempts to make regulations. Problems should be studied carefully.

TRANSPORTATION and traffic, especially in our metropolitan cities, is growing steadily at a rate much faster than the fixed physical facilities provide, and requires immediate study and planning if we are going to catch up with the traffic procession, according to J. Rowland Bibbins, consulting engineer of Washington, who spoke on modern traffic problems before the Philadelphia Engineers' Club last week.

While railroad investment has doubled in 20 years, Mr. Bibbins said, tonnage has doubled twice in 16 years, ton-mileage three times in 11 years, highways and highways transport 4 times in 6½ years and motor registration 5 times since 1910, or 2.6 years average.

The drift of people to the cities was emphasized by the speaker as an important factor. Their population represented only 27 per cent of the United States total in 1880 and over 50 per cent in 1920. Today 40 per cent or 42 millions of our people (over 10 years of age) are engaged in gainful occupation—not far from the population of the whole United States when the Philadelphia Exposition showed the telephone and the trolley as curiosities.

A very hopeful point in city growth is that the basic purchasing power of our cities for public improvements, i.e., assessed land values, is increasing at a steady rate nearly as the square of the population. But transportation demands are increasing much faster, which means that much of the financing must be done by private capital to meet this growth, the balance by taxation, by local district assessment or by both. Thus the New York city budget is reported to have increased for a considerable period as the cube of the population and within 20 years the community will have spent $600,000,000 in transit.

We cannot plan too far ahead to anticipate growth and correct city development, declared Mr. Bibbins. We are suffering from over concentration, increasing length of passenger haul and many other collateral problems. Mere bigness is becoming a liability rather than an asset.

City Life Grows More Complex

The combined effect of all these factors upon our city life is clearly apparent in its growing complexity, cost of living, industrial unrest and labor turnover. And these involve the broad question of housing zoning and the city plan so greatly needed to leaven this whole germinating mass.

Geographic boundaries have no relation to transportation. The 30 minute time zone of rush hour passenger transit practically controls city growth and settlement. This expansion has demanded increased speed, hence the growing use of private automobiles until congestion stagnates the whole system of both transit and highways and business is forced to scatter.

A broad analysis of the transportation problem was presented by Mr. Bibbins in considerable detail. This lies at the very foundation of correct city growth and he insisted that all transportation agencies, rail, water, motor, road, trolley must be reckoned with in any transportation plan worthy of name. This broader conception is still in its infancy he contended and only Boston has officially taken hold of and given recognition to a metropolitan plan.

In the first element of the plan—an adequate thoroughfare system with scientific classification of streets for the traffic they are to carry—he finds most cities are extremely deficient and not alone in the central district. Perhaps the most pressing need today is to schedule and budget a five year program of street reconditioning to develop full roadway capacity, arteries and relief streets.

The second element deals with local transportation, routing and operation by various means including the motor-coach auxiliary and suburban service with all these agencies adjusted to the combined needs of the community on the principle that maximum speed and convenience are essential to adequate service and that the public deserves and will support the best service it can secure.

Better Traffic Control Needed

A scientific system of traffic organization and control follows logically after these major points of thoroughfares and transit have been thought out. While temporary measures often are necessary an elaborate traffic control system should follow rather than precede the other studies as it is the point of final adjustment.

Proper development of railroads and terminals is exceedingly important as commercial freight trucking has become so large a part of downtown congestion. It cannot be worked out satisfactorily by itself. And port-terminal and waterway developments are exceedingly important parts of the city terminal problem and integral with, not separate from, railroads, warehousing and city trucking. Scientfic cartage-control has barely begun and what has happened in rail terminals will be duplicated in air transport unless efficient unification is planned and executed.

All of these elements—rail, water, motor, trolley, rapid transit and air transport must be thought out together and properly adapted to the city and metropolitan plan and the general public welfare, so that development work may be in practicable steps and adjusted to the purchasing power of the city for public improvements, in line with the increasing revenues from property taxation.

Some important details which have not yet been worked out adequately in our cities were touched upon by Mr. Bobbins, such as segregating city traffic horizontally and vertically, developing higher efficiency of traffic signals, determination of actual parking time needed, the economic design of traffic roadways, more convenient man transfers between main lines and feeders with pre-payment loading terminals at heavy points, the ventilation of double deck streets. He showed also the economic possibilities of night deliveries and collection to relieve the streets in the day time and the development of the arcade plan of roadway widening.

As to railroads, he emphasized the off-track type of freight stations with motor deliveries and the fuller de-

velopment of terminal air rights in the downtown districts, terminal recession both passenger as well as freight, and the economic location of belt and switching lines with respect to the city plan and residential areas.

As to the proper method of procedure, Mr. Bibbins emphasized that organized fact-finding is the only proper basis of analysis, design and action.

Planning should follow, not precede this important step.

Technical surveys of traffic transit and terminal movement by road, rail and water are essential, according to the engineer, for proper planning. It is especially valuable to find the origin-destination of passenger and freight movements within the city in considerable detail. Monthly or even daily averages mean little. For the problem of transportation is largely one of financing peak loading, not only for the city, but for the nation's business.

The city-wide problem needs first study, followed by intensive surveys of the central district and then final adjustments of each to the needs of the other. Mr. Bibbins set forth the general idea of planning today for the city or doubling its present size without stopping to quarrel when this will happen and regardless of geographic or political boundaries. Then the transportation plan can be developed in steps as a guide to the city in its improvement work. Industrial and commercial interests can lend great assistance in organizing their commercial vehicle movement to reduce congestion through an efficient form of cartage control.

Organized local civilian support by an advisory body representative of all civic and commercial interests is the final step to the success of any metropolitan plan developed, to subject it to constructive criticism and furnish the powerful support which such a body can give. It can also aid in educational measures to enlighten citizens on the purpose and advantage of such a plan so that the authorities may be better qualified and supported in their official actions.

The real menace today, said Mr. Bibbins in conclusion, is our enormous rate of growth for which no adequate preparation is being made. Those living closest to these problems often lose the proper perspective.

New Book Tells How to Get Publicity

BORROWING for a moment from Mr. Ziegfeld, we may characterize E. L. Bernays' "Crystallizing Public Opinion" as an interesting attempt "to glorify the American press agent." The book dignifies the profession of the publicity agent by the high-hat name of public relations counsel and should be approved highly by all those whose livelihood depends on dispensing more or less sugar-coated propaganda to the public. It is published by Boni & Liveright, New York City.

In the first section the author deals with "The Scope and Functions of the Public Relations Counsel." Here he sets forth the little understood nature of the p. r. c.'s profession. Some call him a propagandist, others, a publicity agent, and still others call him the press agent.

Others vilify him by certain epithets which the scope of this work does not include.

Mr. Bernays shows him "as one who directs and supervises the activities of his clients wherever they impinge upon the daily life of the public. He interprets the client to the public, which he is enabled to do in part because he interprets the public to his client."

Part II deals with the "Group and the Herd." Here Mr. Bernays discusses the simple analogy of what constitutes public opinion, the influence of the individual in the group, and the effect of the public relations counsel on the prior judgments of the public. He maintains that the public mind is malleable and that the public relations counsel, desiring to obtain a hearing for any given cause, simply utilizes existent channels to obtain expression for the point of view he represents.

A study of the mirrors of the public mind—the press, the motion picture, the lecture platform and others—reveals to the public relations counsel what the standards of these mediums are and those of the groups which they reach. To his understanding of what he actually can measure, he must add a thorough knowledge of the principles which govern individual and group action.

The cause which the public relations counsel represents must have some group reaction and tradition coming from the public he is trying to reach. This must exist before they can react sympathetically upon one another.

The public relations counsel can come forward first as a representative of established things when their security is shaken or when they desire greater power, and, second, as a representative of the group which is struggling to establish itself.

In reaching the public, the public relations counsel must realize that people accept the facts which come to them through existing channels. They like to hear new things in accepted ways. They have neither the time nor the inclination to search for facts which are not readily available to them. The expert, therefore, must advise, first, upon the action desirable for his client. Secondly, he must utilize the established mediums of communication in order to present to the public the desired point of view. This is true whether it is that of a majority or a minority, an old or new personality, institution or group which desires to change by modifications or intensification the strength or knowledge and the opinion of the public.

Perhaps the first contribution of the public relations counsel to the public and to his client is his ability to understand and analyze the obscure tendencies of the public mind.

His ability to create those symbols to which the public is ready to respond, his ability to know and to realize the relations which the public is ready to give, his ability to find those stereotypes, individual and community which will bring favorable responses, his ability to speak in the language of his audience and to receive from it a favorable reception are his contributions.

In Part IV, in consideration of the ethical relations between the press and the public relations counsel, Mr. Bernays says the material which the public relations counsel furnishes to the press and other mediums must be truthful and accurate. In addition, it must have the elements of timeliness and interest which are required of all news.

In the last chapter, Mr. Bernays points out that the social value of the public relations counsel lies in the fact that he brings to the public facts and ideas of social utility which would not readily gain acceptance otherwise.

Thus endeth the work of Mr. Bernays, the modest criticism of which probably would include the statement that the distance between the covers is too great.

—J. E. S.

Plant Opens to "Remanufacture" Cars on Production Basis

Twyman Company employs tear down and assembly conveyors for complete rebuilding of some Nash and Buick models. New closed bodies fitted if desired.

THE Twyman Remanufacturing Motors Co. recently finished the equipment and installation of machinery and appliances in its Indianapolis plant and has started to "remanufacture" Buick and Nash cars. As previously announced, this plan, introduced by B. W. Twyman, who laid out and managed the original Nash Four Milwaukee plant, contemplates the rebuilding of Buick and Nash cars for dealers and owners, picking up cars for remanufacture from dealers and delivering the finished product to them. These cars become the "new models" of the Twyman plan, bear a Twyman name plate and carry a standard guarantee similar to that of the N. A. C. C.

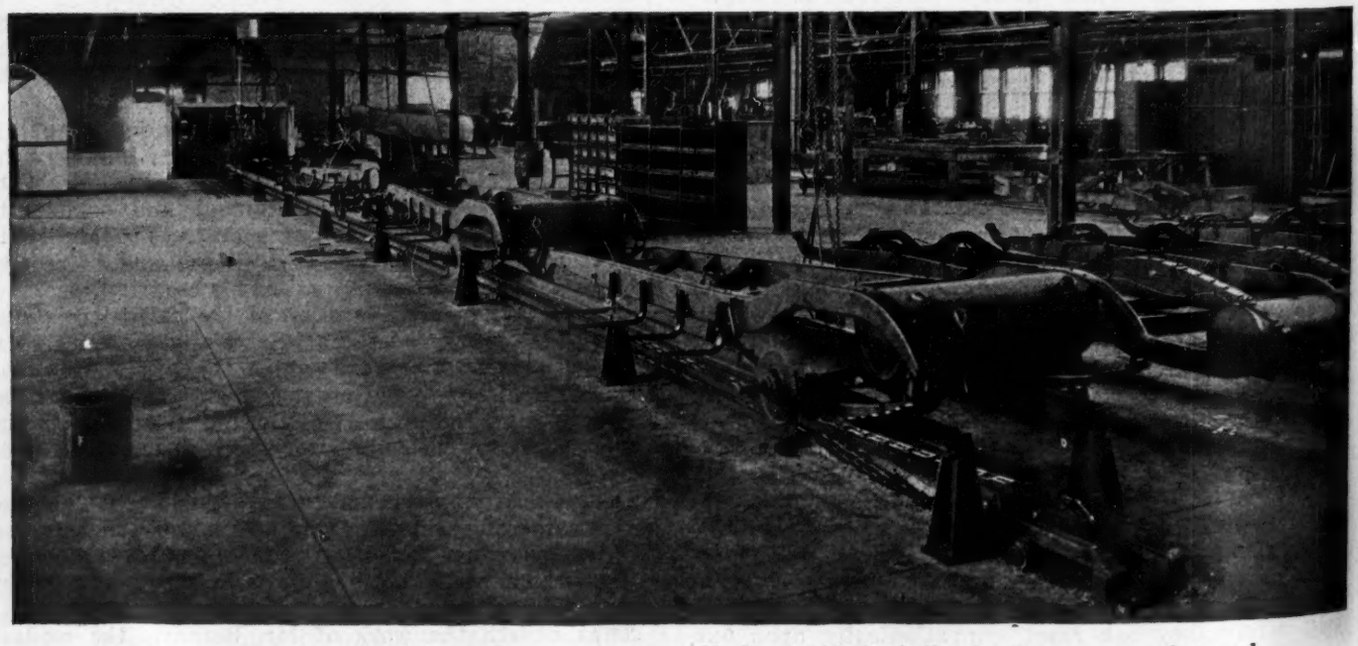
Arrangement and equipment of the plant to do this work by progressive manufacturing methods is said by competent manufacturing men, who have inspected the plant recently, to be unique in the annals of the industry.

After the body has been taken off the chassis the upholstery is removed, and the metal is subjected to a cleansing bath which removes the paint. Thereafter the sheet metal, upholstery and paint and enameling departments perform their respective tasks in putting the body in condition for use.

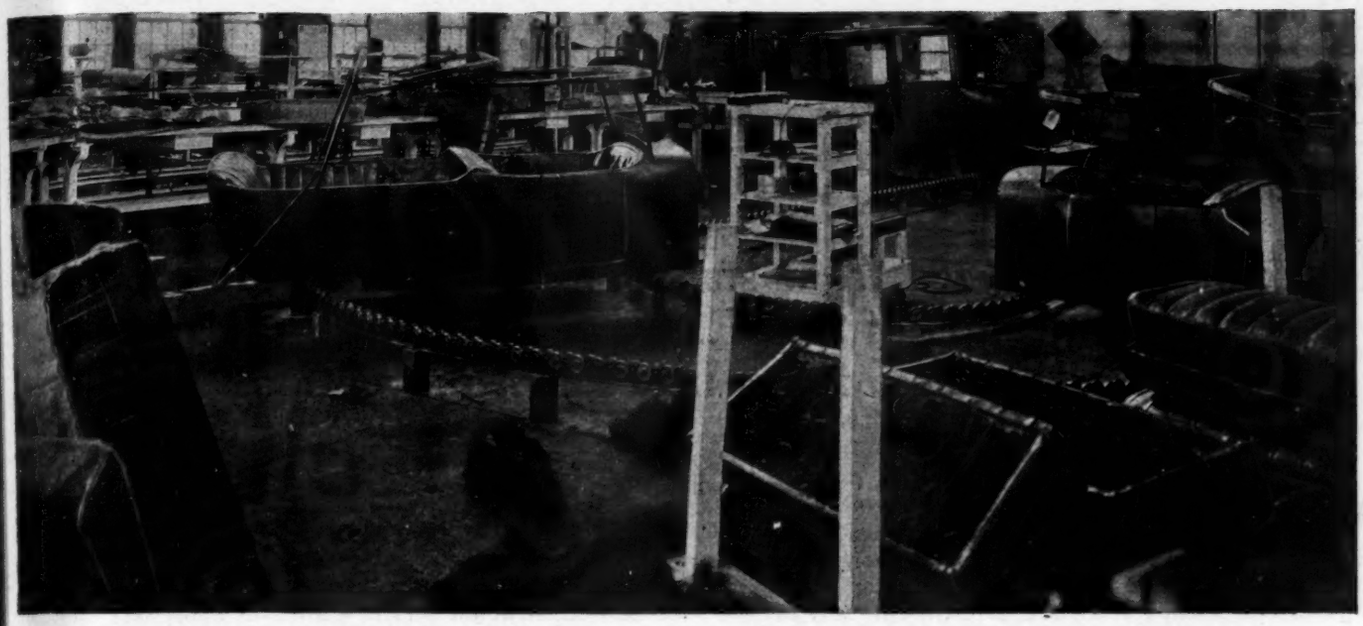
The tear down line for the chassis is the newest thing about the whole idea and plant. Many of the operations there performed are believed never before to have figured in the tear down and rebuilding of motor cars. As the chassis meets the line it is attached to an endless chain, and moves along while one unit after another is removed in an incredibly short time. Short cut methods prevail. Bolts, nuts and other small parts that are going to be replaced with new parts, anyhow, are cut off so that no time is wasted with wrenches.

When the frame reaches the end of the line it is free of all chassis units. It is picked up by an air hoist and dropped into a tank containing a cleaning fluid that cuts off paint, dirt, grease and rust. Other units are handled in similar fashion and are carried by overhead trolleys or conveyors to tanks containing liquid which frees them of paint, grease and other foreign matter. The whole process of tearing down is done on a mass production scale and is, perhaps, the most unusual thing about the new plan.

After the engine has been dismantled cylinders are reground, new over size pistons, and new bearings are supplied and the crankshaft and camshafts are put in serviceable condition. The machine shop, the main portion of which is adjacent to the tear down section, refinishes many parts, makes entire new parts in some cases and in others machines semi-finished parts. Aside from the fact that in this plant about 70 per cent of the car and chassis which is not ordinarily subjected to wear, are used as materials for the production of "new models," the machine shop methods are similar to those in other car producing plants. Bolts, springs, and some other parts are replaced.



Twyman Remanufacturing Motors Co. conveyor assembly line which is similar in all respects to that used in the original assembly of the car. Parts ready for assembly in the chassis are brought from the right. Near the end of the line the chassis is spray painted over a down draft exhaust. It then enters a tunnel drying oven seen in the background



Part of the trimming department in the Twyman plant. Note the unusual arrangement of the conveyor which passes around a corner in order to accommodate the layout of the building

Rebuilt engines are tested much as they are when first manufactured. Gearsets are put into first class condition before they move toward the assembly line.

This line is as modern as can be found in any factory. It compares in size and production ability with those in many well known car manufacturing plants. Here and there are new developments not to be found, it is claimed, even in the most modern of plants. The chassis spray stand, near the end of the first section of this line, is equipped with a forced down draft exhaust into a duct which lies under the chassis.

After spray painting the chassis enters a drying tunnel and when it emerges from the tunnel it is ready for the finished body which meets it at this point. As the complete new car rolls off the line it goes to the testers. In many cases the body that will be fitted is an inclosed type in place of the phaeton or roadster body which came to the plant.

Cars that had been wrecks are said to emerge from this line as attractive in appearance as on the day they came off the original production line. Several of the first jobs put through the plant were of this type to test the sheet metal and body departments and to arrive at accurate cost figures.

In the body department is a roller conveyor designed to carry bodies around a 180 deg. bend or corner and thus enable a compact arrangement without shortening the line.

Mr. Twyman is certain that never before has any one employed mass production methods for rebuilding cars. The tear down and assembly lines with their endless chains are believed to be the only ones of the sort in the world now devoted to conservation of cars that do not wear out.

Many dealers already have been interested in the plan but the most astonishing interest has been displayed by car manufacturers. At least a dozen heads of large companies have visited the plant and some of them have brought engineers to study the layout. There has been some sounding out to see if similar plants could not be set up for other makes and types of cars. Some have indicated that they may themselves attempt such work for their own products.

Delivery end of assembly line. After the chassis issues from the drying oven the wheels, body and some other parts are put in place and the "remanufactured" car is ready for test and delivery

More Accessible Lubrication Fittings Urged by Fleet Operator

Truck design analyzed from standpoint of user at Metropolitan Section meeting of S. A. E. Quality of materials and workmanship factor in accident prevention.

MOTOR truck operators would encounter much less difficulty in maintaining proper lubrication if manufacturers would use more care in designing lubricating fittings, according to J. F. Winchester, supervisor of motor equipment for the Standard Oil Company of New Jersey. Mr. Winchester read a paper entitled "Observations of a Motor Vehicle Superintendent" at the April meeting of the Metropolitan section of the S. A. E. on April 17.

Accident prevention is one of the most important problems before the truck operator, he said, and the truck manufacturer has an equal interest in making the highways safe. He showed how his organization is selling truck drivers on the safety idea by means of bulletins, general publicity, and a system of awards for safe driving records. Motor vehicle manufacturers can assist in the accident prevention campaign, Mr. Winchester said, by using high grade materials and workmanship in the construction of vehicles, since accidents are sometimes due to imperfect materials or faulty workmanship in the truck.

Several ways of improving truck service were suggested by the speaker who has under his supervision more than one thousand motor vehicles operating in seven States. Among his suggestions were:

1. Better "service forms" are needed by motor truck manufacturers to assist their service stations and customers in the selection of part replacement parts.
2. Great opportunities still exist for better chassis lubrication.
3. Brakes should be inclosed to get best results, both from the standpoint of braking and of lining life.
4. The cab should be an integral part of the chassis and not classed as an "extra."
5. Electric lighting equipment should be standard on all motor trucks and is an important field for improvement.
6. Simplicity should be the keynote in all designs.
7. Governors should be designed as an integral part of the equipment, and not specified as an accessory.
8. Engineering departments could avoid duplications on mistakes in new models, by keeping better records of what has passed before.

Notice of Changes Urged

"We find each manufacturer in the commercial field stressing one point or another as promoting economical operation," said Mr. Winchester. "In this field we do not see the yearly rush from one feature to another that we see in the passenger class of cars. In the commercial field changes are made frequently with none, or but little, notice to the user, with the result that service is complicated for he has not known where or when changes have taken place.

"I would suggest that the N. A. C. C. have a standard specification sheet to cover a given type or new model of truck, and supplementary change sheets that would list part changes or deviations from the original model. One copy should be supplied to the fleet owner and one copy to be held on file at the service station in whose territory the truck is delivered. This would assist the fleet owner and it would assist the service departments of the truck manufacturer by tending to cut inventories held at service stations and reduce labor for handling same.

"There probably is nothing more provoking to the user, or embarrassing to the service station than the selection of a part two or three times for a given place before the correct one is found. Improvement is being noted in this line, but standardization is needed."

Chassis Lubrication Can Be Improved

Chassis lubrication presents a fertile field for development, Mr. Winchester believes. "We have seen in the last few years, the practical abandonment of the grease cup and it supplemented by devices such as Alemite, Dot, Thuro and similar systems providing for a more up-to-date service," he said. "Better lubrication and time saving would result if manufacturers would bring all connections for these devices to the outside of the chassis, to suitable and convenient locations, or if they would provide oil wells in the brackets as illustrated by the Myers' magazine system.

"We still find in some chassis, oil holes countersunk which are in plain view while no body is on the chassis, but which are forgotten immediately when the body is applied. A magazine system of lubrication to these and other points built into a chassis would certainly lengthen the life of many parts as compared with present methods. Grease cup elimination, supplemented by new oiling methods, has resulted in decreased up-keep, but based on my observations opportunity still exists for improvement.

"Improvements have been noted in brake material life, in devices for the rapid application and in proper fastening of such devices. An improvement that can still be made in many models is a better arrangement of toggles and levers and in others a closing in of the brake band to protect them from sand and gravel, a factor contributing to very short lining life in some models. I notice that in some cases a manufacturer will inclose the brakes on one model and fail to do it on another. This does not seem logical practice.

"In connection with brakes, a vast improvement has has been made from a standpoint of skid chain clearance in some models recently, but improvement can still be made. Improper clearance results frequently in costly repairs and nasty accidents.

"We have found that brake lining life and the operation of brakes is materially improved by having the brakes in-

closed. Under some extreme road conditions we found brake lining being replaced on an average of 400 to 500 miles. Inclosing the brakes by this method gave us eight to ten times as long brake lining life as compared with when open.

"I have noted at various times, discussions by the wood versus steel wheel manufacturers. As a result, I have watched closely the operation of these two types of equipment, which has caused me to arrive at the following conclusion: Either type, if properly built, has no discernible effect upon tire life. The life of each tire is dependent upon good workmanship and material. Failures have been noted on each type in as low as 12,000 to 14,000 miles.

Cab Should Be Integral Part of Truck

"Cabs should not, in my opinion, be classed as accessories, any more than a body on a car, but since manufacturers list them as extras they are reviewed here. Improvements have been noted, but if various manufacturers would standardize on a design for their various models that would be built from the chassis up, up-keep costs would be reduced. I am much in favor of metal versus any other type. Its life and safety features far offset any objections yet brought to my attention.

"Electric lighting equipment on trucks is still in its infancy from a standpoint of dependability as compared with touring car units. Generator headlight, headlight brackets, and switches still present great opportunity for improvement. What is needed is equipment built to withstand the vibration of motor trucks.

"Speedometers, hubodometers, and meters of various types have improved materially in design. It appears to me, however, that there is still opportunity for improvement in devices of this class along the lines of a mileage and trip recording device which will stand up under truck vibration and which will give a ready history of the truck's activities on one record. In addition to this, better installations should be planned by the truck or speedometer companies, so that the up-keep would be reduced as compared with today. Better location of drives, more substantial gearing and supports for the driving shaft are the points in mind.

"Governors are generally recognized as a necessity and are being insisted upon by law. The governor should be an integral part of the motor. When designed as such it assures both the manufacturer and the user that maximum results will be obtained from a power development and fuel economy standpoint. It should be simply and ruggedly built.

Accessibility Desired

"The point I would stress is simplicity and accessibility in design. Too often these factors are overlooked and it behooves the fleet superintendent to watch for such items and improve upon weak points if it can be done economically so that the future operation may be conducted more economically.

"One point along this line can be noted by a change that eliminated a torque rod on one of our trucks. This change tended to simplicity, did away with the up-keep of a certain part which gave trouble every 5000 to 7000 miles, did away with the necessity of re-bushing that part frequently and did away with the replacement of certain parts of the spring axle housing which would have to be replaced every 15,000 to 17,000 miles. By keying the spring saddle seat and then brazing it to the balance of the axle arm, the old part was continued in service and has performed satisfactorily over a period of 35,000 to 40,000 miles.

"Another change along similar lines was made in another model truck whereby the radius rods were eliminated, which resulted in up-keep of this part being omitted. Personally, on trucks up to 2½ tons capacity, I can see no good reason for other than the Hotchkiss drive being employed.

"Along the line of accessibility might be mentioned the need for attention of engineers to better facilities for changing oil. Changing oil is recommended in practically all cases at certain intervals, yet it is made a difficult task in a majority of cases because suitable or accessible means for this purpose have not been provided. Proper provision in all units would certainly encourage this important process and promote longer life.

"Designers should be careful to take into consideration what has passed before and it behooves any factory organization to have and keep on file a suitable set of service records or historical facts regarding its products, so that mistakes of the past will be avoided in the future designs.

"Some of the simple mistakes that have been noted or encountered in the new models, causing expensive repairs, indicate to me that this is not done in many cases. The result is that a burden is handed along to the operator."

Safety of Retail Credit Structure Must Be Guarded

(*Continued from page* 905)

to repossess the cars involved. Credit concerns which are doing business on a 'no recourse' basis would be the chief sufferers, as the dealers assume no responsibility. They also would have to share the losses on all other transactions in this category.

"All these repossessed automobiles would be thrown on the market for what they would bring. No imagination is required to see what would happen. Dealers would be unable to sell used cars taken in trades and lacking such an outlet they would find the demand for new products seriously circumscribed.

"As long as general business conditions remain as good as they are now the situation holds no menace and the development we have outlined possesses only an academic interest, but when a depression does come that interest will become immediate."

The quotation is from the editorial pages of Automotive Industries of March 20.

The time has arrived when the interest is passing from the academic to the immediate stage. Every person in every branch of the automotive business, manufacturer, wholesaler and retailer, should tighten up sharply both on credits and collections.

Automobile manufacturers and automobile dealers have plentiful stocks of finished cars on hand and they should work together in closest harmony to liquidate these stocks without loss to either. The used car will be the crux of the whole situation. The natural inclination of the harassed, heavily stocked dealer is to make price concessions and get rid of his stocks on almost any terms. Such risks are foolhardy at any time, however, and most of all in a period of declining general business.

Fewer sales made on a sound basis will return greater profits in the long run than many more sales made on an unsound basis. This is one fact which manufacturers should hammer home at every opportunity.

When sales are slipping, dealers are prone to recklessness in time sales and in this recklessness they are being aided and abetted by even more foolish finance companies. Time sales of every commodity should be based on a single fundamental question:

IS THE PROSPECTIVE PURCHASER A GOOD CREDIT RISK?

If the answer is yes, the sale is justified.

Railcar Design Problems Presented to Automotive Engineers

Market for gasoline propelled vehicles on railroads growing. Powerplant and transmission chief units requiring attention. Engine mounting is important.

By P. M. Heldt

IT is now apparent that the next few years will see the introduction of gasoline-propelled motor cars on railway systems on a considerable scale. The railroads are compelled to change their methods, partly by the popularization of automobiles, which has deprived them of a great deal of their local passenger traffic, and partly by the competition of motor buses and interurban electric lines. Operation of steam trains involves a comparatively large expense which is independent of the amount of traffic, and if the traffic is light the service often is unprofitable.

Although early attempts to apply gasoline engines to railway cars did not prove successful, the railways now seem to have come around to the view that in the use of such motor cars, either singly or in trains of two, lies their salvation in handling certain traffic. The extent to which the railroads of the country have become interested in motor cars is shown by the fact that in 1923 no less than forty-six railroads in the United States ordered such cars. Most of the equipment, of course, was placed in service in an experimental way, and the whole movement is still in an experimental state.

SEVERAL years of experience now is behind engineers engaged in railcar design but many points exist on which there is considerable difference of opinion. Since the next few years are likely to determine the part played by automotive manufacturers in supplying the growing market for vehicles of this type, thorough discussion of design questions is pertinent at this time.

The author has expressed his views frankly on certain technical problems involved in railcar construction. Probably other engineers will differ with some of the conclusions drawn. In any case, we will welcome a free expression of differing and confirming opinion.

In considering the adoption of self-contained motor cars for use on railway tracks it must be borne in mind that gasoline is not the only possible motive power. As a matter of fact, among the sixty-nine motor cars purchased by American railways during the past year were two steam and eight storage battery cars. Abroad, notably in Sweden, cars equipped with Diesel engines are being used successfully, but these are very much heavier than any railcars used in this country so far. This is due partly to the relatively large weight of Diesel engines and partly to the use of electric drive. The latest type of Diesel-electric car developed for use on the Swedish state railways weighs 55 tons and is capable of hauling a total load of 180 tons provided grades do not exceed 1 per cent. What led to this development in Sweden probably was the high price of imported coal, which made crude oil, burned under conditions of maximum economy, seem a more desirable fuel.

The consensus of engineering opinion seems to be that under present conditions in this country and Canada the gasoline motor of the automotive type is best adapted to the purpose. That even a big majority of the railroad men are convinced of this is shown by the fact that 87 per cent of all the railcars purchased by American railways last year had engines of this type. The engines themselves have been developed to a high degree as regards silent and vibrationless operation and high output per unit of weight, and the technique of their manufacture also has reached a very advanced state. There always are cases subject to special conditions—exceptions to the rule—and, while it is quite possible that steam and storage battery cars will fill certain requirements better, there can be little doubt that cars propelled by automotive type gasoline engines will have the big call.

This being so, the manufacture of the powerplants for these cars naturally should fall to the automotive industry, which has the experience and the equipment to turn out such powerplants under the most efficient conditions. Aside from the engine, one of the difficult problems of railcar design is that relating to the transmission of power from the engine to the axle, and the control of the torque. The experience of the automotive industry in solving similar problems should insure to it also the business of furnishing such parts as the clutch, the change speed gear and possibly the gears for the final drive.

In addition to the engine and transmission there will be need for carbureters, ignition, starting and lighting equipment, radiators and mufflers, and the respective branches of the automotive industry should profit from the development of the railcar.

When it comes to the trucks and the car bodies, these undoubtedly can be built to best advantage by the established car builders. It may seem easy for automotive engineers to improve upon present standards of railway truck construction, particularly from the standpoint of weight reduction, but it is a pretty safe assumption that any engineering practice which is the result of nearly a century of constant development has a pretty good economic basis. Railway engineers and car builders are not unaware of the development of alloy steels, processes of heat treatment, etc., and if they thought they could use

these modern materials and methods in their practice to advantage they undoubtedly would do so. However, owing to the fact that traction resistance is far lower on steel rails than on roads, and the further fact that on railroads grades are almost eliminated, the engineer is not warranted in spending much extra money on equipment in order to cut down weight and reduce fuel consumption.

Transmission Presents Difficult Problem

The transmission of power to the axle or axles, as already pointed out, presents a very difficult problem. From a purely constructional standpoint it probably can be solved to best advantage by the use of electric drive. In that case the gasoline engine would be direct-connected to an electric generator which would furnish current for street railway type electric motors mounted on one or more of the car axles. But whether the system is equally promising from an economic standpoint is very much to be doubted.

The reason for this is that with electric transmission there must be carried on the car three distinct power generators or sets of power generators, each of a capacity in excess of the maximum power ever applied to the driving axles. The power must first be generated in the gasoline engine; this must be coupled to a generator of substantially the same output capacity. Finally, the electric motors must have a combined capacity equal to that of the generator. Hence the weight of the whole powerplant will be unduly high. From the standpoint of efficiency the electric transmission also would leave something to be desired, because all of the power applied to the driving axles would have to undergo two complete transformations, from mechanical into electric power in the generator and from electrical into mechanical power in the motors.

Advantages of Electric Drive

One advantage of the electric drive is the ease with which remote control can be applied to it. It has been found highly desirable that motor railcars, the same as trolley cars, should be controllable from both ends, in order that it may not be necessary to turn the car end for end at the terminals of the line. This involves that the car shall be capable of operating at the same speeds in both directions, a requirement which is readily met with electric drive by merely reversing the direction of rotation of the electric motors. It also involves the use of control gear at both ends of the car, from which connections must be made to some part of the powerplant and, as with electric drive these connections are in the form of electric cables; there is less complication and less chance of derangement than where the connections are of a mechanical nature. This advantage of the electric drive had been annulled, however, by the application of electro-magnetic and electro-pneumatic control to cars propelled by gasoline engines.

The second type of transmission available for use is the hydraulic type. It comprises a pump of variable delivery, driven directly from the gasoline engine, which is connected to hydraulic motors mounted directly on the axles. Some of the objections raised against the electric drive apply also to the hydraulic drive, notably the great weight and the low efficiency. In addition there is the disadvantage of having to keep hydraulic joints under high pressure tight against leakage. The pressure employed in such hydraulic systems necessarily varies with the ratio of transmission. At low car speeds the pressures usually become very high, and if the fluid medium of transmission has to pass through so-called universal couplings the difficulty involved in preventing leaks can be imagined. Many attempts have been made to apply the hydraulic drive to motor trucks but if even one achieved commercial success it escaped the writer's notice.

There are two conditions which render the mechanical transmission of power from the engine to the driving axles a difficult problem. The first depends upon the fact that in order to obviate noisy operation the pitch diameters of the gears must be kept down, so as to maintain low pitchline velocities. The second condition has to do with the mounting of the powerplant. It is practically impossible to mount a gasoline engine directly on the axle box frames of railcar trucks, as is done in the case of electric motors. The delicate parts of the engine and its accessories, such as the carbureter and ignition set, would suffer from the severe vibration to which they would be exposed in that case and, besides, the carrying of a lot of dead or unsprung weight directly on the axle is good neither for the axle nor for the rails and roadbed. Some sort of spring support must be provided for the powerplant.

Mounting the Powerplant

On the other hand it is not a very satisfactory plan to mount the powerplant directly on the car frame which carries the body. In that case the vibrations of the engine are communicated directly to the body and, especially in the case of engine types in which there are definite free vibrating forces, such as the four-cylinder vertical, the conventional eight-cylinder 90-deg. V engine with single-plane crankshaft, etc., the car becomes decidedly uncomfortable on long rides. It would seem, therefore, that the powerplant should be spring-mounted, but not on the same springs as the car.

There is one feature in connection with the railcar field which will make it appear rather unattractive to the automotive industry; that is the practical impossibility of large scale production. Even after the scope of the field of the motor railcar has been pretty well defined and the best types of design have been agreed upon to the same extent as best practice in automobile manufacture is now settled, there is little hope for production on a scale warranting investment in equipment of the kind now used in automobile production.

There are two possibilities as regards the lines of development. Either a few concerns in the automotive field (or coalitions of automobile and car building firms) may develop designs of railcars which they may offer as a standard product to the railroads, refusing to make any material changes in design for individual customers so far as the mechanical part is concerned, or the initiative may be taken by the railroads, whose engineering departments may work up designs in cooperation with the engineering departments of firms which may get contracts for part of the construction work.

Cooperative Design Preferable

It is obvious that from an economic standpoint the first mentioned scheme would be preferable by far. There is room in the railcar field for only a limited number of firms and the general chance of the railcar would be considerably better if experimentation were confined to that number of firms than if it were carried on by practically every railroad engineering department in the country. By experimentation in this case is meant experimentation in design, not in operation.

It is, of course, true that conditions of operation vary to a certain extent on different lines and in different parts of the country. Thus it has been found that—contrary to requirements in the East—in the agricultural districts of the Middle West there is a demand for about as much baggage space as for passenger space. The farmers in these districts, when they want to go themselves anywhere within reasonable distance, travel in their automobiles, but they often want to ship produce or get supplies from

neighboring cities when they have no time to go in their cars. This yields a considerable amount of express business, the so-called baggage space in the railcars being in reality express goods space.

All such variations in requirements can be met by changes in carbody design, however, and have nothing to do with the trucks which support the car. The important point is limitation to a relatively small number of designs and production in quantity of those parts whose production costs can be greatly cheapened in this way. This probably applies to no part so much as to the powerplant.

Rôle of Self-Contained Car

We are thus led to a consideration of the rôle which the self-contained motor car will play in railroad operation in the future. The first application of motor cars in the present movement was on branch lines where, owing to the increase of private passenger automobiles or competition from bus lines, the passenger traffic had become so light that it no longer paid for the cost of steam train service. On such lines converted motor trucks or omnibuses were mostly used.

The front axle of these trucks was removed and a four-wheel truck substituted therefor, and the rear wheels of the truck were replaced by flanged car wheels. In some cases second-hand trucks were converted in this way and, as the cost of conversion was not high, the financial risks involved in the experiment were not great. It is obvious that this class of car is a makeshift and has no permanent place in railroad operation. It served its purpose, however, in demonstrating the possibility and economic advantage of the self-contained motor car.

So far as through traffic on trunk lines is concerned, that is very satisfactorily accomplished by means of steam trains and there is no chance for the motor car in this branch of the business. The heavy suburban commuter service in the vicinity of our large cities also is accomplished quite satisfactorily by steam trains where the lines have not yet been electrified. There may be objections to the steam trains, but they come more from the people living close to the roads than from actual users of the service.

Useful in Non-Rush Hour Service

However, on all of these lines there is a service separate from strict commuter service, that is, aside from the rush-hour trains into the city in the morning and out from the city in the evening. And this service during non-rush hours and on holidays often leaves much to be desired. The reason for this unsatisfactory service is the same as that mentioned in the early part of this article; that is, there is a certain minimum cost attached to the running of a steam train and expenses cannot be made unless a certain minimum number of passengers can be counted on. Hence, the number of trains is reduced to increase the number of passengers per train.

With individual motor cars or tractor-and-trailer trains a more frequent service could be given without increasing operating cost. Such improved service would certainly be appreciated by residents along the roads and would tend to increase traffic, quite aside from the question of drawing traffic away from competing services.

When we think of the railroads, what comes to mind first is the big trunk lines between the great centers of population. But in addition to these there are a great many short lines or branch lines the passenger service on which, as a rule, is relatively poor. Very large must be the number of towns in the United States which have one train a day in each direction, often at very inconvenient hours. Increase in the frequency of service in such cases would automatically increase the volume of traffic. There is no such pressure for improved service here as in the vicinity of large cities, because the residents of these country towns have never known better facilities. In these districts, however, much of the loss of passenger traffic is due to the inconvenience of the service rendered, and there is certainly a fine field for the railcar on such lines.

Just where the dividing line for the field of the steam train and the self-contained motor car in railroad work will lie it is impossible to say at this early stage of railcar development. It will be a matter entirely of cost of operation. When the traffic is heavy the steam train is most economical; when it is light the motor car can be operated more cheaply. The dividing line lies where the operating costs of the two systems are equal.

One other factor that has a bearing on the situation is the possible electrification of the lines. The use of electric power supplied through trolley wires or third rails reduces the increase in cost due to a more frequent service, because for such service motor cars can be used, instead of electric locomotives. However, although the electrification of the railroads has been a live topic for more than twenty years, very little has been accomplished to date. The expense involved is very high and the more the roads need a change in method of operation in order to economize the less they are able to bear the burden of electrification. Hence this factor need hardly be taken into account in making a survey of the field for the railcar.

Timken Making Steep Angle Bearings

IN September, 1920, steep angle Timken roller bearings were first adopted for use on the worm shaft of the Fordson tractor. This bearing, which has a double row of tapered rollers set at a greater angle to the shaft axis than is used in the ordinary Timken bearings, is capable of taking high thrust loads in either direction. The allowable thrust load capacity is, in fact, about three times the radial load capacity. Some 327,000 of these bearings are reported to have been placed in service to date. A similar bearing designed for taking thrust loads in one direction only is also available. These bearings are known as the 78000 series.

Another bearing of similar design, but intended for use on rear axle spiral bevel pinion shafts of 30 to 33 deg. angle, known as Series 43000, first was adopted for use in production on passenger cars in 1922. Over 380,000 bearings for this application have been produced and the makers claim that not a single failure due to a faulty bearing yet has been reported. Among the cars using bearings of this series are Dodge, Columbia, Chrysler, Cleveland, Gardner, Jewett, Jordan, Moon, Peerless and Yellow Cab. In addition to the above mentioned production about one million of these bearings have been manufactured.

A modification of the steep angle type of Timken bearing also is being produced in considerable quantities for use on gearset shafts.

AS a concession to the farming population in compensation for a reduction in the import duty on grains, the French Government has reduced the import duty on agricultural machinery by reducing the coefficients applying to this class of imports. Thus the coefficient on gasoline engines has been reduced from 3.1 to 2, bringing the rate of duty down 52 francs per 100 kg. (about $1 per 100 lb. at the present rate of exchange). Apparently this rate also applies to gasoline-propelled farm tractors. For portable steam engines (traction engines) the rate has been reduced to about 80 cents per 100 lb.

Care in Design Reduces Costs of Castings

Hinderances to production are found in simple as well as in complex constructions, says British engineer. Manufacturing requirements are not sufficiently considered by designer.

IN the design of any machine part the designer must keep two things in view—the purpose for which the part is intended and the materials of and processes by which it is to be made. Processes and materials might be considered two distinct items, but in most cases the process is dependent upon the material; for instance, parts of cast iron are made only by casting.

In designing cast iron parts, by giving proper attention to the limitations of the process it is often possible to use both the material and the labor employed in their production to better advantage. Not only the quality but also the cost of the castings is dependent upon the methods by which they are produced, and these methods are largely determined by the design.

Some of the points which must be looked after in casting design were discussed by F. C. Edwards in a recent article in *Engineering* of London. Mr. Edwards wrote in part as follows:

Really efficient casting design is extremely rare. In the simplest, as well as in the most complicated of castings, one may find hinderances to production and more or less wastage—or misuse—of material. The reason is not far to seek. Broadly speaking, the case is twofold. In the first place, the drawing office seldom appreciates the enormous effect of good and bad design, respectively, upon quality and quantity of output. It thus unconsciously imposes an initial handicap on foundry efficiency. Secondly, the foundry is usually too prone to accept, and to make the best of, any design it may be called upon to execute. Such acquiescence tends to perpetuate bad design.

The special peculiarity of casting design lies, of course, in the fact that metallurgical considerations must supplement mathematics in arriving at the strength of a component. However accurately the loads which the component is required to carry are calculated and allowed for, and however great the "safety factor" employed, unless the effects, say, of shrinkage, are taken into account, the casting may fail in service. In extreme cases of bad design, the casting literally falls to pieces under its own cooling stresses.

It seems desirable, therefore, that the draughtsman who is accustomed to designing structures, say, of wood or of mild steel, in order efficiently to design castings, should "adopt a new way of thinking." That this is a vital preliminary is shown by a moment's consideration of the evolution of design in general. It is invariably found that, in the employment of a new material, the old designs—i.e., those used with the earlier (and, perhaps, fundamentally different) material—persist and prejudicially retard the establishment of the new material. The best known case, perhaps, in which existing design was "carried forward" into a new set of conditions is that of the motor car. The designers of the earlier forms blindly followed the shapes of the horse-drawn vehicles. Redundant features (i.e., viewed in the light of present-day motor car evolution) were allowed to remain, and improvements in design, rendered possible by the new method of propulsion, were generally ignored.

Similarly with casting design. It is by no means uncommon to find castings designed in a manner which would be quite satisfactory if they were to be composed, say, of wood. Adjoining members have sharp re-entrant angles which remind one of framed woodwork. And comparatively light sections of metal in close contiguity with heavy sections resemble thin, paneling attached to strong beams. These incongruities (i.e., from the point of view of casting design) are even met with in combination. Such cases may be said to be the foundryman's *bêtes noir;* try as he may, he cannot insure a sound casting in these circumstances. On the other hand, only a limited use is made of the vast potentialities of casting metal into molds. Forms, which, in materials where grain direction has to be considered, would be far too fragile for purposes of utility, may be produced *ad infinitum.* Indeed, the curved shapes —S-shaped arms, for example—by tending to neutralize cooling stresses, actually promote the strength of a casting.

To be really efficient, casting design should tend to reduce the operation of molding to its simplest possible terms—consistent, of course, with the ultimate purpose of the casting. This naturally involves some knowledge of foundry practice on the part of the draughtsman. Having decided, from the general contour of the job, which way the pattern will best withdraw from the mold, the draughtsman should arrange the details of the design so as to facilitate such withdrawal. A good taper, for instance, judiciously applied (i.e., wherever the nature of the design renders permissible) will do much in the way of securing accuracy by obviating disturbances of the mold during the withdrawal of the pattern. And, of course, it facilitates speedier production. The necessity for loose pieces in molding should be reduced to a minimum. Many a casting has been rejected as scrap because of some loose piece on the pattern being moved out of position while the job was being molded. Sometimes, indeed, the loose piece is inadvertently left in the mold, and, if it happens to be of wood, it is subsequently destroyed by the molten metal.

Design for Repetition Work

In repetition work, especially, it pays to differentiate between good and bad casting design. The cumulative effect of eliminating even minor hindrances to production, or of the saving of a small amount of metal on each casting, may, on a large order, easily make the difference between profit and loss.

That design *per se* is the ultimate determining factor of the strength of a casting is seen from testing considerations. It is generally admitted that, as a criterion of the strength of a casting, the test bar test may be worse than useless—it may give a false sense of security. Actually, as a measure of strength (i.e., strength of casting as a whole), its worth—even if it is cast on the casting—is strictly limited to itself; it indicates the composition of the metal at its own peculiar section when located in the particular part of the mold and subjected to the specific temperature conditions in which it was itself cast and cooled. The same metal, given a different cross section, or cast and cooled under different conditions gives different test results.

New Design Features Appear in Recent

Bosch Adjustable Impulse Coupling

THE American Bosch Magneto Corp. of Springfield, Mass., announces a new adjustable impulse coupling for use with all models of its high tension magneto. This new impulse coupling, which is known as Type IC-200, is designed to facilitate starting of large engines on

American Bosch type IC-200 impulse coupling

trucks, tractors and motor boats without the use of an auxiliary battery system.

The coupling is a spring device and is enclosed in a steel housing. It is adapted for both clock-wise and anti-clockwise rotation, the change over being made in a few minutes. The driving member is accurately adjustable for timing, and a coupling disk renders the drive flexible.

It is claimed that with this new impulse coupling there is no possibility of back-kicks.

Hartford Shock Absorber

WHEN a car is being driven over the road and one of the wheels strikes an obstruction, the spring nearest to that wheel is compressed by the shock, and energy is stored up in it. Owing to the fact that steel is an almost perfectly elastic material, this energy is given out again and sets the car body into vibration. These vibrations may continue for a considerable period.

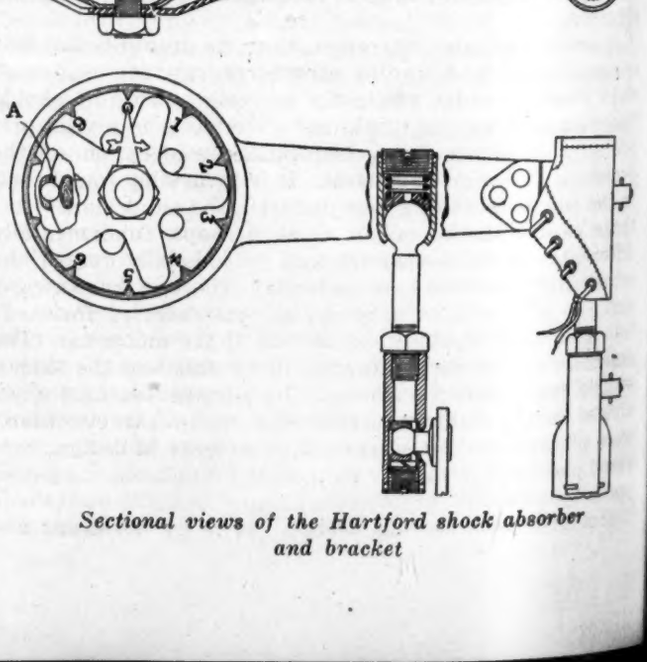
What makes up and down vibration of the body uncomfortable to the passengers is the acceleration that accompanies it. It is the high rate of acceleration that it is desirable to prevent by means of shock absorbers.

Bearing the above conditions in mind, Edward V. Hartford, Inc., have redesigned their well known Hartford shock absorber so as to provide a neutral range of motion over which there is practically no retarding action on the spring. The new Hartford, like its predecessor, is of the friction disk type, but the member endowed with a rocking motion is now made in two parts which have a certain degree of angular freedom relative to one another. The parts of the rocking member are concentric, the outer one having formed integral with it the arm which connects by a link to a bracket on the axle. The inner part is a snug fit within the outer one and is driven from the latter by means of a roller clutch which takes hold only after the outer part has rocked through a certain angle from its central position.

Referring to the cut-away side view herewith, notches are cut in the inner circumference of the outer and the outer circumference of the inner part, in which is lodged the steel roller *A*. The notch in the outer part is of elongated form, so that the roller has a certain freedom of motion within it. A C-type of spring on the inner side of the roller presses the latter against the bottom of the notch in the outer part, and after the outer part has rocked through a certain angle the roller reaches the end of the notch in it and the inner part is carried along. This allows of a spring play of about ⅝ in. to either side of the normal position before the inner part of the rocking member begins to move.

The rocking member is located between two disks of treated wood, such as used in oil-less bearings, which are surrounded by shallow cups of pressed steel. The frame bracket and the stud around which the rocking member moves are made in a single piece, and the friction members are assembled on the stud and are pressed together by two star-shaped steel springs which are put under pressure by means of a nut on the end of the stud. The smaller spring, which chiefly determines the pressure between the wood disks and the inner part of the rocking member, is by far the stiffer of the two, and little resistance to the rocking motion is encountered as long as only the outer part moves. As soon as the inner part is engaged by the roller clutch the resistance greatly increases, and the real shock absorbing action begins. An adjustment dial is secured to the outside of the housing and an indicator hand is placed under the adjusting nut so as to turn with it, this arrangement making it easy to adjust all of the absorbers on any car equally. The device is self-centering, and even if the springs should sag in use, the roller would still be at the center of the elongated notch when the car is at rest.

For the connection of the shock absorber arm to the axle bracket, use is made of a ball joint, in order to overcome the twisting effort on the device due to swaying of the car body on turns, etc. The socket member of this ball joint is made of pressed steel and is a very nice manufacturing proposition. This part is riveted to the end of the arm on the rocking member and is protected by a leather boot. It will be noticed that there is a compara-



Sectional views of the Hartford shock absorber and bracket

Products of Parts and Accessory Makers

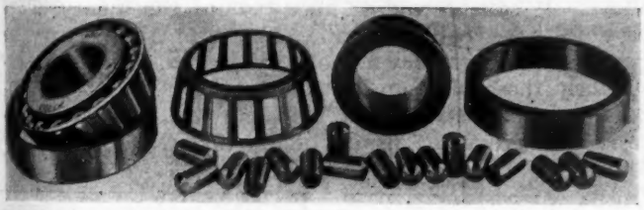
tively heavy spring within this joint, and that there is therefore no chance of rattles developing at this point.

The new Hartford shock absorber is made in three sizes, to suit different sizes of car. Brackets have been designed and mounting methods worked out for all of the better known makes of car. The writer had a chance to test the riding qualities of a Willys Knight sedan fitted with these shock absorbers and found that there was absolutely no feeling of discomfort in riding over cobblestones and other rough pavement at speeds up to 35 m.p.h.

Bock Adds to Line of Bearings

AN important addition to the line of bearings manufactured by the Bock Bearing Co. of Toledo, Ohio, recently has been made to meet what is said to be an increasing demand for narrow bearings of the taper roller type.

This new bearing, which is designated "D type," does not depart in any respect from the fundamental principles which governed the design of other Bock taper roller bearings, but it incorporates a one-piece cage construction and spherical headed rollers which are not necked as they were formerly and which do not have a head of larger diameter than that of the largest portion of the cone. With this construction it has been possible to increase the number of rolls per bearing and the consequent load capacity.



New D-type Bock bearing assembly and parts

As formerly, the head is ground to a true radius, the center of the spherical surface of the head lying in the axis of the roll. This spherical surface contacts with a flange on the inner race of the bearing at a point such that a pure rolling action takes place.

Contact surfaces of both cup and cone have a width equal to the length of the roller's conical surface so that the rollers cannot wear in the races ridges which would interfere with adjustment.

The new bearing is recommended for use at points where a wider bearing would be objectionable as well as in positions where the service is severe, even though the space is not limited. It is made in sizes interchangeable with other roller bearings.

Briggs-Stratton Has New Motor Horn

A NEW model of motor horn, known as the Model B Basco horn, has been brought out by the Briggs-Stratton Co., Milwaukee. The diaphragm and bell design are said to be such as to result in a loud, penetrating tone, and the characteristics of the electric motor are claimed to insure the almost instant production of the full tone.

The motor is of the consequent pole type. Brushes of impregnated carbon are carried in brush holders pivoted on knife edges, which are said to make it impossible for the brushes to stick. The brass bearings are lubricated through two convenient oil holes. By means of an adjusting screw at the rear of the horn, which can be operated either by a screwdriver or a thin coin, the tone can be changed.

Model B Basco horn

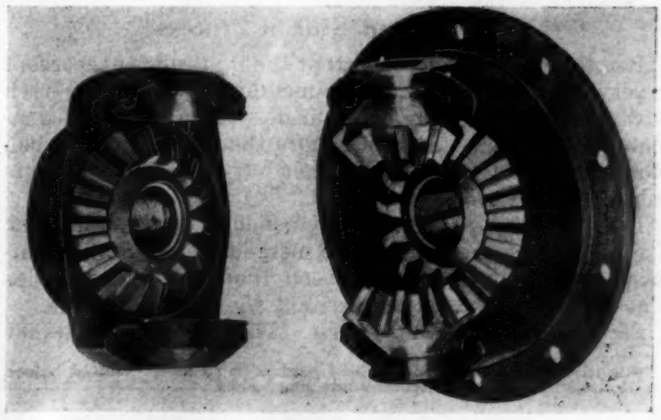
Removal of a cover held in place by one screw gives access to the brushes for inspection or replacement.

Maurice Walter's Self-Locking Differential Gear

A NEW differential gear of the self-locking type has been invented by Maurice Walter of Long Island City, N. Y., and has been placed in production for Ford car, truck and tractor replacements by the Milwaukee Forge & Machine Co., Milwaukee, Wis. As may be seen from the accompanying illustrations, it differs from the ordinary two-pinion bevel gear type differential only in that the bevel pinions, instead of being mounted on studs or on a central spider, are supported in what are described as V groove bearings. The difference in the actions of this and the ordinary differential is due to the greater friction at the bearings of the pinions in this device.

It is claimed that this increased friction does not interfere with the differential action when the car describes a curve, and power consumption tests made on electric vehicles are said to have shown that there is no appreciable loss of power when rounding corners. On the other hand, it was found possible to transmit 75 per cent of the whole power through one wheel when that had more traction than the other.

One other advantage claimed for this differential is that it does not permit one of the drive wheels to be locked by its brake if this brake holds better than the other, and that it thus eliminates the chief cause of dangerous side skids.



Aluminum and Magnesium Pistons Have Many Advantages

Decreased weight, lessened friction, freedom from carbonization and lower temperature of oil film are among desirable qualities. Growth with increase in temperature of small consequence, while proper heat treatment easily overcomes warpage difficulties.

By Leslie Aitchison*

GENERAL adoption of light alloy pistons for aero engines is powerful evidence that they possess some solid advantages as compared with their cast iron rivals. That some disadvantages accompany the advantages is scarcely to be denied, but it is certainly held that the advantages outweigh the disadvantages. The benefits accruing from the use of light alloy for pistons have been stated by Mr. Ricardo to be as follows:

1. Owing to its lighter weight the friction is reduced substantially and the loading on the connecting rod bearings, due to the inertia of the reciprocating parts, is greatly relieved.
2. Owing to the lower temperature of the crown, no carbonization of the lubricating oil takes place on the underside. In the case of cast iron pistons, the oil tends to carbonize on the underside of the crown, falls down into the crankcase, fouls the rest of the lubricant, and often chokes up the oil filter and oil pump section.
3. Owing to the lower mean temperature of the oil film between the piston and cylinder walls, considerably less oil may be used without risk of piston seizure.

It scarcely will be denied that this is pre-eminently a fair statement. Doubtless the case in favor of the light alloy piston might be put even more strongly.

In view of these admitted advantages, the comparative neglect of the aluminum or light alloy piston by the automobile industry is worthy of examination. Probably there are many reasons for the non-usage—some sound and others probably illusory. Some of these reasons appear to be bound up with the design of the automobile engines, and of such reasons the author is scarcely competent to speak. Other reasons, he thinks, are connected fairly definitely with the comparatively incomplete information possessed by engineers regarding the materials that are available, and it seems, therefore, appropriate to supply some relevant facts in regard to the variety of light alloys which are put forward for the consideration of the automobile engineer.

Development Still in Process

It must not be overlooked that the light alloys represent a very recent development in metallurgy, and that fresh advances are constantly being made. Aluminum as a commercial product is not much more than twenty years old. No finality has yet been reached or approached on this subject.

It is equally true that a tremendous amount of work has been carried out upon the metallurgy of the light alloys. The groundwork has been thorough and provides a good and solid basis for the light alloys of the future.

Pistons will be discussed first. The light materials that are of interest in the present connection are the alloys of aluminum and of magnesium respectively. Pure aluminum is not a material that is employed for pistons, but pure magnesium has been so employed, and is likely to be employed even more, as it has given considerable satisfaction on the Continent. As aluminum appears to have been alloyed at one time or another with nearly every metallic element known to science, some discrimination obviously must be exercised in presenting data regarding those particular alloys that are to be taken as typical of the useful alloys. It can be said at once that of the binary alloys very few are really valuable, and that the ternary or quaternary alloys that are of real service are almost exclusively those built up by using as a basis alloys of aluminum with those alloying elements that have been successful in producing useful binary alloys.

Properties of a Good Alloy

If a proper discrimination is to be exercised in the choice of an alloy, the properties to be looked for in a good alloy should be clearly understood. The following schedule, therefore, gives those particular attributes that may conveniently form the basis of a true comparison:

1. Mechanical properties—strength, ductility and toughness—at ordinary temperatures.
2. Mechanical properties at elevated temperatures.
3. Machinability.
4. Permanence.
5. Ease of production in a sound state.
6. Thermal conductivity.
7. Thermal expansion and contraction.
8. Cost.
9. Specific gravity.
10. Melting range.
11. Facility of running in a cylinder.
12. Hardness to resist wear on skirts and lands.

By permanence is meant generally the absence of continuous or sudden changes of volume during service, a reasonable freedom from change of mechanical properties, a freedom from liability to disintegration under normal conditions and freedom from corrosion or erosion under working conditions. Ease of production is probably better to understand than to define completely. In any case it must be taken to mean that the metal can be produced readily as sound castings by any ordinarily competent foundry without any undue proportion of wasters due to porosity, shrinkage and the like. It also means that the subsequent treatment of the material can be carried through expeditiously and without undue expense.

Facility of running in a cylinder involves an absence from seizing and also from undue wear. It will be appreciated that most of these properties enter into the considerations of the engineer who may wish to design and

*Slightly condensed from the first part of a paper presented before the British Institution of Automobile Engineers.

make a light alloy piston, and it also seems on the other hand that these properties provide him with all the information that is needed for the establishment of form and shape and clearances.

Light alloys are used both in the cast and the wrought form, and some distinction must be made between them. The wrought forms include the forged, the drop-forged and the pressed types. Initially the cast alloys will be dealt with as being better known and more likely of adoption at the present time by anybody making a venture into the field of light materials for pistons.

Among the light alloys suitable for production as castings are both binary and ternary alloys. The most firmly established are the binary alloys of aluminum with zinc, with copper or with silicon. Among the ternary alloys are those of aluminum with zinc and copper, while there are quaternary alloys of aluminum with copper, nickel and magnesium. In addition, there are the binary alloys of magnesium with copper and with aluminum.[1]

Copper Raises Tensile Strength

Probably the best known series of binary aluminum alloys is that with copper. The general effect of the addition of copper is to raise the tensile strength of the aluminum, to reduce its ductility and to increase its specific gravity, as indicated in Table 1,[2] from which it will be seen that it is possible to obtain quite a respectable tensile strength by adding a suitable proportion of copper to aluminum, but only at the cost of incurring a very marked increase in density. The alloy which contains about 15 per cent of copper has a maximum stress about the same as that of gray cast iron, and a specific gravity about 40 per cent of that of cast iron.

The general result of the addition of zinc to aluminum is very much the same as that of the addition of copper. Once again the strength and the density are raised and the ductility lowered, as will be seen from Table 2.[3] In general terms there does not appear to be a great deal of difference between the effect of equal proportions of copper and zinc, except that the zinc bearing alloys are rather more ductile.

The other best known binary alloys of aluminum are those with silicon, which represent a fairly modern development and are now being manufactured in England, the United States, Germany and France. There appear to be two kinds of alloy that are favored—the material difference between them consisting only in the percentages of silicon that are present therein, which are respectively 8 to 10 and 12 to 14. The silicon alloys have some fairly remarkable properties in themselves, but only their mechanical properties and specific gravity need be given. See Table 3. From this it will be seen that the silicon alloys are the lightest of all the binary alloys of aluminum so far quoted, a fact which in itself makes them of particular interest. It is also evident that such alloys possess a very good ductility—much better than customarily is found in the cast alloys of aluminum that have a strength round about 12 tons per sq. in.

As the light alloys for pistons always will be compared with the cast irons available for the same purpose, it may be desirable to give some indication of the properties of such irons. Some typical values are shown in Table 4.

In considering the ternary aluminum alloys with zinc and copper, it is hardly possible, in a short paper, to indicate their properties so fully as for the binary alloys, the number of ternary alloys required to indicate the conclusions being too great. A selection of results obtained on various alloys of this type is, however, given in Table 5.

By a further development from these ternary alloys, the metallurgical department of the National Physical Laboratory has evolved an alloy which, in the cast condition, gives very interesting strength values. The alloy, which is in most respects very similar to duralumin and is known as "Y alloy," contains copper, nickel and magnesium as its leading alloying elements. Unfortunately, in order to attain to the most valuable properties of this alloy, a casting has to be heat treated. Although this is a troublesome and expensive operation and is likely to be very detrimental to its general adoption, the properties, both physical and mechanical, of the cast Y alloy are sufficiently interesting to warrant quotation, and these, before and after heat treatment, are given in Table 6. The superiority of the heat treated material is very evident.

With respect to the alloys of magnesium, the existing

[1] An alloy is stated to be "of aluminum" or "of magnesium" if the preponderating part consists of that element. Usually the alloys contain not less than 80 per cent of the type element.
[2] See Carpenter and Edwards, 8th Report Alloys Research Committee.
[3] See Rosenhain and Archbutt, 10th Report Alloys Research Committee.
[4] See Rosenhain, Archbutt and Hanson, 11th Report Alloys Research Committee.

Table 1—Properties of Chill Cast Aluminum-Copper Alloys

Copper, Per Cent	Max. Stress, Tons Per Sq. In.	Elongation, Per Cent	Specific Gravity
0	5.2	37.0	2.70
1	6.1	15.5	2.73
2	8.2	17.0	2.75
3	8.6	10.5	2.78
4	9.6	10.5	2.81
5	9.6	6.0	2.88
6	9.9	5.0	2.85
7	9.4	4.0	2.87
8	10.6	3.0	2.90

Table 2—Properties of Chill Cast Aluminum-Zinc Alloys

Zinc, Per Cent	Max. Stress, Tons Per Sq. In.	Elongation, Per Cent	Specific Gravity
0	5.2	37.0	2.70
5	6.6	29.0	2.76
9	7.8	11.0	2.84
13	10.7	10.5	2.93
16	11.4	6.5	2.99
19	13.7	7.0	3.05
23	13.5	3.5	3.15

Table 3—Properties of Typical Aluminum-Silicon Alloys

Silicon, Per Cent	Max. Stress, Tons Per Sq. In.	Elongation, Per Cent	Specific Gravity
8	10.0	10.0	2.67
10	12.5	9.0	2.66
13	14.75	7.5	2.65

Table 4—Properties of Typical Cast Irons for Pistons

Graphite, Per Cent	Combined Carbon, Per Cent	Silicon, Per Cent	Phosphorus, Per Cent	Max. Stress, Tons Per Sq. In.
2.86	0.49	1.76	0.47	14.6
2.54	0.39	1.41	0.95	18.6
2.60	0.36	1.97	0.43	18.6
2.60	0.71	1.55	0.79	13.4

Table 5—Properties of Typical Chill Cast Aluminum-Copper-Zinc Alloys[4]

Copper, Per Cent	Zinc, Per Cent	Max. Stress, Tons Per Sq. In.	Elongation, Per Cent	Specific Gravity
1	10	11	15	1.96
3	10	13	11	2.93
1	15	13	10	2.96
2	15	15	16	2.99
3	15	14	7	3.03

Table 6—Properties of Chill Cast Y Alloy

Condition	Max. Stress, Tons Per Sq. In.	Elongation, Per Cent.	Specific Gravity
As cast	13.7	3.3	2.82
[5] Quenched in water from 530 deg. C. and aged six days	23.38	14	2.82

Table 7—Properties of Magnesium-Aluminum Alloys

Aluminum, Per Cent	Max. Stress, Tons Per Sq. In.	Elongation, Per Cent	Specific Gravity
0	7.5	6	1.74
2	7.1	6	1.75
4	6.9	4	1.76
6	11.0	7	1.77
7.5	9.5	4	1.78
11.0	9.0	1	1.79
12.5	6.2	0	1.82

Table 8—Properties of Magnesium-Copper Alloys

Copper, Per Cent	Max. Stress, Tons Per Sq. In.	Elongation, Per Cent	Specific Gravity
0	7.5	6	1.74
2	7.4	3.5	1.77
3	8.5	6	1.79
4	6.4	2	1.80
6	6.1	1	1.83
13	7.0	0	1.95

[5] See Rosenhain, Archbutt and Wells, J. Inst. Met., 1923, I, 200.

Table 9—Properties of Magnesium-Nickel Alloys

Nickel, Per Cent	Max. Stress, Tons Per Sq. In.	Elongation, Per Cent	Specific Gravity
3	8.8	4	1.78
6	9.4	2	1.82
9	10.4	2	1.86
12	11.0	1	1.90
16	10.8	0	1.94
20	11.2	0	1.97

Table 10—Properties of Magnesium-Zinc Alloys

Zinc, Per Cent	Max. Stress, Tons Per Sq. In.	Specific Gravity
4	5.5	1.78
5	6.0	1.79
6	7.7	1.81
7	9.4	1.82
8	11.0	1.84
9	9.5	1.85
10	8.0	1.87
11	7.7	1.89
12	7.4	1.91

Table 11—Properties of Various Cast Ternary Magnesium Alloys

Copper Per Cent	Zinc Per Cent	Aluminum Per Cent	Max. Stress, Tons Per Sq. In.	Elongation Per Cent	Specific Gravity
3	..	2	7.3	2.0	1.78
3	..	4	9.1	2.5	1.79
3	..	6	9.1	3.0	1.80
3	.	8	8.2	0.5	1.82
..	2	6	7.2	1.0	1.80
..	6	2	9.2	3.0	1.85

knowledge is not so extensive as that of the aluminum alloys. The magnesium alloys that have been used are nevertheless by no means few in number, and a fair number of test results are available. Among the better known alloys are those with copper and with aluminum. There are also those alloys known as Electron, which are of rather varying composition, though zinc in small quantities is a leading component. In the cast form all these alloys give valuable and interesting results, as indicated in Tables 7 to 11. It may be stated that the test figures given are rather to be regarded as minimum values, present day castings giving somewhat better results.

All the mechanical results expressed so far are those that have been obtained from tests made at room temperatures. For the purposes of piston design it is really more important to know the values of the mechanical properties of the alloys when exposed to their working temperatures. There may be some difference of opinion as to what temperatures are developed in a piston when it is working under its most adverse normal conditions, but so far as the light alloy pistons are concerned, it seems to be fairly established that the maximum temperature that generally is attainable is round about 400 deg. C. It is unlikely that this temperature is reached all over the piston crown for any length of time, and a maximum working temperature of about 350 deg. C. is probably rather nearer the truth—on the average. There are, of course, times when, by severe local heating, the piston in some parts attains even higher temperatures which usually, sooner or later, result in its burning. For the present purpose, therefore, it seems to be not unreasonable to select temperatures up to 350 deg. C., and in Table 12

Table 12—Tensile Properties of Various Piston Alloys at High Temperatures

Alloy	Condition	Max. Stress, Tons Per Sq. In. at 250° C.	Max. Stress, Tons Per Sq. In. at 350° C.
Pure magnesium	Cast	6.1	4.6
Magnesium + 11 per cent aluminum	Cast	5.6	4.6
Magnesium + 13 per cent copper	Cast	6.7	4.7
Aluminum + 12 per cent copper	Chill cast	6.9	4.7
Y alloy	Chill cast	11.3	5.1
Aluminum + 14 per cent copper + 1 per cent manganese	Chill cast	10.0	6.3
Aluminum + 8 per cent copper	Chill cast	7.0	3.3
Aluminum + 13 per cent zinc + 3 per cent copper	Chill cast	4.2	1.5
Cast iron A	Sand cast	13.2	13.4
Cast iron B	Sand cast	11.5	10.5

Table 13—Brinell Hardness Numbers of Various Piston Alloys at High Temperatures

Alloy	Condition	Brinell Hardness Number At 15° C.	At 200° C.	At 300° C.	At 400° C.
Aluminum + 12 per cent copper	Sand cast	67	58	33	14
Aluminum + 12 per cent copper	Chill cast	82	63	35	13
Aluminum + 8 per cent copper	Sand cast	55	43	25	11
Aluminum + 8 per cent copper	Chill cast	60	46	28	12
Aluminum + 13 per cent zinc + 3 per cent copper	Sand cast	79	36	15	..
Aluminum + 13 per cent zinc + 3 per cent copper	Chill cast	62	35	16	..
Y alloy	Sand cast	71	61	46	17
Y alloy	Chill cast	76	68	53	..

Table 14—Mass Strength of Various Alloys at Room Temperatures

Alloy	Condition	Max. Stress, Specific Gravity
Aluminum + 12 per cent copper	Cast	3.6
Aluminum + 8 per cent copper	Cast	3.1
Aluminum + 13 per cent zinc + 3 per cent copper	Cast	3.6
Aluminum + 15 per cent zinc	Cast	3.7
Aluminum + 14 per cent copper + 1 per cent manganese	Cast	3.8
Y alloy	Cast	4.8
Y alloy	Cast and heat-treated	8.2
Pure magnesium	Cast	4.3
Magnesium + 3 per cent copper	Cast	4.7
Magnesium + 13 per cent copper	Cast	3.6
Magnesium + 6 per cent aluminum	Cast	6.2
Magnesium + 11 per cent aluminum	Cast	5.0
Cast iron A	Cast	1.9
Cast iron B	Cast	2.3

Table 15—Strength-Weight Ratio of Various Alloys at High Temperatures

Alloy	Condition	Max. Stress-Specific Gravity at 250° C.	350° C.
Pure magnesium	Cast	3.5	2.6
Magnesium + 11 per cent aluminum	Cast	3.1	2.5
Magnesium + 13 per cent copper	Cast	3.4	2.4
Aluminum + 12 per cent copper	Chill cast	2.3	1.5
Aluminum + 14 per cent copper + 1 per cent manganese	Chill cast	3.3	2.1
Aluminum + 8 per cent copper	Chill-cast	2.4	1.2
Aluminum + 13 per cent zinc + 3 per cent copper	Chill cast	1.4	0.5
Y alloy	Chill cast	6.2	1.8
Cast iron A	Sand cast	1.7	1.7
Cast iron B	Sand cast	1.5	1.4

are given the tensile strengths and in Table 13 the Brinell hardness numbers of various light materials at temperatures up to this figure. For purposes of comparison the values for some representative cast irons are also given.

In all the tests that have been given so far the values are quoted in terms of tons per sq. in.; that is, in terms of strength per unit area—the tests representing the ratio of strength to volume. A more illuminating method of examination of these very various metals is to consider the strength per unit mass—in other words, to take the ratio of strength to weight. This is most conveniently done by dividing the strength values by the density of the material. The resulting values provide a more suitable criterion for the comparison of the alloys, and give a figure that may be referred to as the mass strength or strength-weight ratio. For the different alloys that have been referred to so far a series of values for this property at room temperatures is given in Table 14, and for the alloys when heated to different high temperatures in Table 15. For the sake of completeness the value of the modulus of elasticity and also the ratio of the modulus to the density of the different metals are given in Table 16. It will be seen that the values of the latter property are not conspicuously different in the various alloys.

It is always considered that one of the most vital properties of the light alloys is their superior thermal conductivity when compared with cast iron, and to this property the success of the light alloy piston is due in a great measure. It is to be expected that the thermal conductivities of the alloys will be high, because those of the basic metals—aluminum and magnesium—are also very high when compared with that of cast iron. The actual values for the different alloys are quite well established, at any rate for temperatures at or near to atmospheric. There is nothing in the nature of the alloys to make it likely that these values undergo any fundamental change at elevated temperatures; that is, those attained during working in an engine. In Table 17 are given a number of values actually obtained experimentally. Although they vary a little among themselves, the alloys of aluminum and of magnesium are all markedly better conductors of heat than is cast iron or any metal of the ferrous group.

Thermal Expansion

A property that generally is regarded as a very marked disadvantage in respect of the employment of the alloys of aluminum and also of magnesium is their coefficient of thermal expansion. As with the thermal conductivity, there is a great deal of difference in the values for this property between cast iron and the light alloys. When heated, all the light alloys expand much more than does cast iron. This fact, of course, has a very marked effect

Table 16—Modulus of Elasticity of Various Alloys and the Modulus-Weight Ratio

Alloy	Condition	Mod. of Elasticity, Tons Per Sq. In.	Mod. of Elasticity-Specific Gravity
Magnesium	Cast	2,800	1,650
Magnesium + 6 per cent aluminum	Cast	2,850	1,620
Magnesium + 11 per cent aluminum	Cast	2,880	1,600
Magnesium + 13 per cent copper	Cast	2,900	1,580
Aluminum + 8 per cent copper	Chill cast	4,200	1,450
Aluminum + 12 per cent copper	Chill cast	4,200	1,380
Aluminum + 13 per cent zinc + 3 per cent copper	Chill cast	4,200	1,380
Y alloy	Chill cast	4,350	1,550
Cast iron A	Sand cast	6,500	850
Cast iron B	Sand cast	6,500	850

Table 17—Thermal Conductivity of Various Alloys at Atmospheric Temperatures

Alloy	Condition	Thermal Conductivity in C.G.S. Units
Pure magnesium	Cast	0.375
Magnesium + 6 per cent aluminum	Cast	0.180
Magnesium + 11 per cent aluminum	Cast	0.211
Magnesium + 3 per cent copper	Cast	0.345
Magnesium + 13 per cent copper	Cast	0.308
Aluminum + 12 per cent copper	Sand cast	0.34
Aluminum + 13 per cent zinc + 3 per cent copper	Chill cast	0.31
Aluminum + 8 per cent copper	Chill cast	0.35
Y alloy	Chill cast	0.37
Aluminum + 14 per cent copper + 1 per cent manganese	Chill cast	0.27
Cast iron	Sand cast	0.102

upon the clearances to be allowed between the pistons and the cylinder walls and deserves a great deal of attention. In respect of thermal expansion rather greater variations occur than in respect of the termal conductivity, the value for the silicon alloys in particular differing rather markedly from that of the other light alloys, as indicated in Table 18.

Table 18—Coefficient of Thermal Expansion of Various Alloys at Atmospheric Temperatures

Alloy	Condition	Coefficient of Thermal Expansion
Magnesium	Cast	0.0000256
Aluminum + 8 per cent copper	Cast	0.0000231
Aluminum + 12 per cent silicon	Cast	0.0000184
Aluminum + 12 per cent copper	Cast	0.0000264
Cast iron	Cast	0.0000102

Closely allied with the subject of thermal expansion is that of "growth." It has been stated with almost wearisome persistence that aluminum alloys "grow" considerably when they become heated in an engine. What is clearly inferred is that the metals change their density—undergoing a permanent expansion. What really is meant generally is that when pistons are put into service with a certain clearance, this clearance lessens in the course of time, sometimes to the extent of causing the piston eventually to seize.

Careful examination of the matter has shown that the observation and the inference are by no means concerned with one and the same thing—as might possibly be expected. On closer investigation the real facts emerge, and it then appears that nearly everything depends upon the condition of the casting at the time that it is put into the engine.

It can be shown that the real "growth" is almost illusory—that is, that there is no such marked change in physical properties as is inferred by the term growth. Neither does anything occur that corresponds even most remotely with what occurs in some kinds of cast iron and is well known in that connection under the established name of growth. The distortion and the permanent change of volume produced in typical light alloys by repeated heatings to, or by a prolonged heating at, a temperature equal to that attained by the pistons in an engine have been studied carefully by the Air Ministry during the war[6] upon properly prepared specimens, with a result which shows that the growth is negligibly small. It was found than an aluminum piston, when heated, first expands regularly. When a temperature of about 250 deg. C. is attained, the expansion becomes slightly more rapid and the piston continues to expand even though the temperature be maintained approximately constant. This increase constitutes what is generally known as the growth, and is more or less permanent.

At this same temperature the piston alters in shape, and this is the time at which the warping above referred to occurs. This change of shape is naturally a permanent one. When the piston cools, normal contraction occurs, but the piston has changed shape in consequence of the warping, and has also changed slightly in consequence of the small amount of growth which has occurred. Subsequent repeated heating and cooling may increase both the growth and the warping, though to a comparatively small extent, depending upon the length of time to which the first heating extended.

Ordinary thermal expansion of an aluminum piston is in itself very great, as will be realized when it is stated that a 4-in. piston heated to a temperature of 250 deg. C. will expand some 0.023 in. Test results show that the growth that is obtained on a 4-in. piston is almost invariably less than 0.004 in., which is quite a small quantity compared with the ordinary thermal expansion. In one very extensive series of tests it was found that the growth never exceeded 0.003 in. on a 4-in. piston, but that distortion or warping to the extent of 0.016 in. occurred.

If warping of this magnitude takes place at a temperature when the piston is normally expanded by some 0.020 or 0.030 in., it is evident that trouble readily may arise from such a cause. As the warping is so very much greater than the growth, it is also evident that troubles which arise from diminution of clearances can be attributed much more definitely to the former than to the latter cause. In actual fact the growth is of comparatively small importance in connection with aluminum pistons.

The same investigation shows that pistons, when annealed as suggested herein, are practically stable, and that the amount of growth which occurs subsequently is of the order of between 0.001 and 0.002 in. on a 4-in. piston, and is therefore practically negligible.

All these tests go to indicate that growth in aluminum pistons can be neglected in comparison with the changes of dimension due to the ordinary thermal expansion and contraction of the material. The distortion is not so negligible, and it is important to insure that the material is free from a tendency to distort, which can be readily secured by suitable annealing.

All aluminum pistons are cast in comparatively thin sections, and therefore cool fairly rapidly. In addition, very many are cast in chill molds, which certainly hasten the rate of cooling. Therefore it may be taken that a piston is a fairly quickly cooled casting. It is further to be noted that within the average piston casting there is a moderate variation of section, the pin bosses and even the crown being generally of considerably greater thickness than the skirt. This means that the normal shrinkage which occurs during casting will be different in the various parts of the piston. Apart from any other possible causes, the chilling action and the different shrinkages in the casting undoubtedly set up a state of considerable stress between the different parts. This stress always is likely to diminish if opportunity serves. If it does diminish, there may be a change of shape but not of density in the casting.

Changing of Stresses

There are two prime opportunities for the alteration of the stresses. The first occurs during the machining of the casting. As a rule this operation only partially relieves the stresses, and in some instances may actually increase them in certain portions of the article. The second occasion on which the stresses may be affected is when the castings are heated, which increases the ease with which they may rearrange themselves internally.

With an unannealed casting, this heating will first occur when the machined castings are run in the engine. Naturally, the metals will then tend to set themselves so as to dissipate the stresses under which they are constrained, and this alteration of the stress distribution may easily result in a change of shape. Undoubtedly, what has been described happens to many pistons when they are introduced into an engine and put into service. What happens is not that the pistons *grow* but that they *warp*—an entirely different thing.

Fortunately, the remedy for this trouble is a simple one. Clearly, the dissipation of internal stresses should be achieved after the rough machining has been carried out, as this operation itself at times strains the metal—permanently—to some extent. It should, however, be done before the final machining. The most satisfactory way of

[6] See Jenkin—Materials of Construction for Aircraft, 1920.

bringing about the release of the strains is to heat the piston to a suitable temperature before putting it into service—thus forestalling the effect of heating in the engine.

A temperature that will release the internal strains and at the same time do no harm to it is about 400 deg. C., which is probably rather higher than any that the piston ever attains in normal service, and is certainly quite high enough to dissipate any strains locked up in the metal. An exposure for two or three hours is strongly to be recommended, and very slow cooling is not at all a necessary adjunct to success. It can be stated with certainty that such a treatment will provide all the freedom from warping that can be needed, and will remove any grounds for complaint on the score of growth.

One of the most obvious differences between cast iron and the light alloys as materials for the manufacture of pistons is the difference in melting point between the two types. Strictly speaking, reference should not be made to the melting point, because the metals do not melt at a "point"; that is, a definite temperature, but melt during a range of temperature, the range being in some of the light alloys of considerable extent, for example, 170 deg. C.

This matter is worthy of some little attention as it has a direct bearing on one hand upon the local overheating or burning that sometimes occurs with light alloy pistons. On the other hand, the melting range has a very definite bearing upon the casting temperatures of the alloys. Burning is associated with the lower end of the melting range—that is, the completion of freezing—while the casting temperature is more directly concerned with the upper limit of the melting range; that is, the commencement of freezing.

Effect of Zinc in Aluminum

Freezing of pure aluminum occurs at quite a definite point, 657 deg. C—not over a range. If, now, to this aluminum say 5 per cent of zinc is added, the resulting alloy does not melt at a definite temperature, but during a range. Freezing starts at a temperature of 650 deg. C. and is not completed until a temperature of 600 deg. C. is attained. The presence of the zinc in the aluminum has two effects—first, that freezing does not start till a lower temperature than the freezing point of pure aluminum and, second, that it proceeds during a protracted range of temperature. If still more zinc is added—for example, 10 per cent—the temperature at which freezing starts is still lower than with the 5 per cent alloy, being now 640 deg. C., and the completion of freezing is also lowered still further; that is, to 550 deg. C. With 15 per cent of zinc the temperatures at which freezing starts and ends are respectively 630 and 520 deg. C.

In between the temperatures marking the upper and the lower limits of freezing, the alloys—whatever proportion of zinc they contain—consist of both liquid and solid portions, the actual proportions of which depend upon the composition of the alloy and the temperature at which the observation is made. In general terms it can be stated that at higher temperatures more of the liquid is present than at the lower temperature portions of the freezing range. The most important thing to remember is that when the alloy is being heated and reaches the lowest limit of its freezing range some melting occurs and a portion of the alloy passes into the liquid condition.

Copper Reduces Freezing Point

Addition of copper to aluminum has a similar effect, though with a certain difference. The presence of the copper reduces the temperature at which freezing commences—roughly in proportion to the amount added. It does not, however, change the temperature at which freezing is completed proportionately to the amount of copper added. When 5 per cent of copper has been added to the aluminum, the freezing starts at 645 deg. C. and ends at 545 deg. C. When 10 per cent is present, the freezing starts at 630 deg. C. and ends at the same temperature as before. This, of course, is a typical feature of a eutectiferous series. All the ordinary copper-aluminum alloys which can be called light contain a constituent that freezes at a temperature of 545 deg. C. In Table 19 are set out the temperatures at which freezing starts and ends in alloys containing different proportions of zinc, while in Table 20 are shown the corresponding temperatures for a series of copper alloys. The main point to be noted about the figures in these tables is that they indicate quite definitely that all the alloys of aluminum with zinc and copper that are likely to be commercially useful possess the power of melting—at any rate in part—at a temperature very much lower than the melting point of pure aluminum, a fact which naturally has some considerable effect upon the behavior of the alloys used for pistons.

The alloys of aluminum and silicon show similar characteristics and the temperatures at which freezing starts and ends in alloys with a commercial silicon content are indicated in Table 21.

Table 19—Freezing Ranges of Aluminum-Zinc Alloys

Zinc Per Cent	Freezing Commences at Deg. C	Freezing Ends at Deg. C.
2	652	620
4	649	610
6	646	590
8	643	570
10	640	550
12	635	535
14	630	525

Table 20—Freezing Ranges of Aluminum-Copper Alloys

Copper Per Cent	Freezing Commences at Deg. C.	Freezing Ends at Deg. C.
2	650	610
4	645	560
6	640	545
8	635	545
10	630	545
12	625	545
14	620	545

Table 21—Freezing Range of Aluminum-Silicon Alloys

Silicon Per Cent	Freezing Commences at Deg. C.	Freezing Ends at Deg. C.
4	630	575
8	600	575
10	575	575
12	595	575

Table 22—Freezing Ranges of Magnesium-Copper Alloys[1]

Copper Per Cent	Freezing Commences at Deg. C.	Freezing Ends at Deg. C.
2	641	485
4	631	485
6	620	485
8	610	485
10	600	485

Table 23—Freezing Ranges of Magnesium-Aluminum Alloys[1]

Aluminum Per Cent	Freezing Commences at Deg. C.	Freezing Ends at Deg. C.
2	642	617
4	632	584
6	623	550
8	614	515
10	640	480

[1] Hanson and Gayler, Journ. Inst. Met., Vol. 24, p. 201.
[2] R. Sahmen, Zeitsch. Anorg. Chem., Vol. 57, p. 26.

The temperature which limits definitely the working range of an alloy is that which causes the first melting of any part of the material. It has been shown that in most of the useful alloys of aluminum this temperature is round about 550 deg. C. In a low phosphorus cast iron the temperature at which incipient melting occurs is very much higher, namely 1150 deg. C., while in a high phosphorus iron the phosphide eutectic melts at a temperature of 960 deg. C. For reasons connected with carburation and the like, temperatures of this order are never attained in a cast iron piston, but under some conditions of service the local heating of an aluminum alloy piston may cause a temperature to be attained which approximates that at which incipient melting of the material takes place.

Characteristics of Magnesium Alloys

The magnesium alloys present features that are similar to those possessed by the aluminum alloys. Pure magnesium melts at 651 deg. C., and naturally its alloys show slightly lower temperatures for both the commencement and the completion of freezing. The values for the temperatures of these changes in the magnesium-copper alloys are given in Table 22, and for the magnesium-aluminum alloys in Table 23. Naturally, with pure magnesium, which seems to be very useful for pistons, the temperature at which melting commences is higher than in the alloys —being in fact 651 deg. C. From the table it will be seen that the maximum temperature to which the magnesium alloys may be heated is about 480 deg. C., rather lower than the corresponding temperature for the aluminum alloys.

It is a generally sound rule that light alloys should be cast from the lowest convenient temperature. More troubles are encountered through casting at too high a temperature than from any other cause. Even a matter of 10 deg. C. is quite sufficient to exercise a marked effect upon the results of the casting process. There is no doubt that a careful control of this factor by means of pyrometers is quite essential to the successful production of castings of the best quality.

Light alloys are particularly susceptible to the effect of chilling, and when chilled have a distinctly higher maximum stress than the same alloy not chilled. Not only, however, is the strength raised, but the ductility is improved by chill casting—a matter that is of quite equal importance and of particular interest since it is distinctly different from the usual effect of raising the strength of metals by more rapid cooling.

Perhaps the greatest danger in the casting of the light alloys arises from the exceeding weakness of the alloys at temperatures not very far removed from those at which the freezing is completed. Naturally, at such temperatures the stresses arising from shrinkage and contraction begin to be felt in the alloy, and the feebleness of the alloys makes them but little able to endure these stresses. As a result, very many castings pull themselves to pieces by stresses that they themselves set up at or about this time. It is very important, therefore, that castings should be stripped from the molds as early as possible after complete solidification—particularly those that are cast in chill molds. Cores that cannot be removed from the casting till it is cold should be made as friable as possible so that they may easily crush and thereby offer the minimum resistance to the contraction of the castings that they serve to form. Draws and shrinkage cracks are very easily produced in light alloys.

For the purposes of designing patterns, the shrinkage of these various alloys is given in Table 24, from which it will be seen that the shrinkage does not vary very greatly among the different alloys except that the value for the silicon alloys is distinctly lower than those for the remainder of the alloys. The value for cast iron is quoted for purposes of comparison.

Alloys Recognized as Best Compromise

To avoid the consideration of too many details, it seems quite reasonable to assume that such conditions as those suggested have actually operated, and that some selection among the various possible materials has been exercised, the result being that certain alloys have become recognized as the best compromise between mechanical properties, weight, soundness and ease of production. The alloys that have emerged may be examined a little more in detail as to their suitability for use as pistons.

Probably it is correct to take the following materials as representing the results of the processes of selection that have gone on consciously and unconsciously with respect to the various light alloys:

(a) Aluminum plus 13 per cent copper.
(b) Aluminum plus 8 per cent copper.
(c) Aluminum plus 3 per cent copper plus 13 per cent zinc.
(d) Aluminum plus 10 per cent silicon.
(e) Aluminum plus 13 per cent silicon.
(f) Magnesium plus 6 per cent aluminum.
(g) Magnesium plus 13 per cent copper.

In order to enable a fuller comparison of these alloys to be made, the leading characteristics of all of them are given side by side in Table 25.

It is clear at once that the zinc alloy (c) is inferior to the other aluminum alloys in that its strength at high temperatures is seriously lower. This is an almost insuperable objection to a piston alloy, and for this reason the alloy does not find favor. The alloy (a) is rather heavier than the other aluminum alloys, and although its

Table 24—Patternmakers Shrinkage of Various Light Alloys

Alloy	Shrinkage (inches to 1 foot length)
Aluminum + 12 per cent copper	15/100
Aluminum + 8 per cent copper	14/100
Aluminum + 13 per cent zinc + 3 per cent copper	15/100
Aluminum + 15 per cent zinc	17/100
Aluminum + 10 per cent silicon	12/100
Cast iron	12/100
Magnesium	12/100
Magnesium + 6 per cent aluminum	14/100
Magnesium + 11 per cent aluminum	15/100
Magnesium + 3 per cent copper	14/100
Magnesium + 13 per cent copper	15/100

Table 25

Alloy	a	b	c	d	e	f	g
Specific gravity	2.95	2.90	3.04	2.65	2.65	1.76	2.0
Max. stress (15° C.), tons per sq. in.	11.0	9.0	11.0	12.0	12.0	11.0	7.5
Max. stress (250°C.), tons per sq. in.	6.99	7.0	4.3	7.6	8.2	5.6	6.7
Max. stress (350°C.), tons per sq. in.	4.7	3.3	1.6	4.8	5.2	4.6	4.7
Young's modulus, tons per sq. in.	4,200	4,200	4,200	3,900	3,900	2,850	2,900
Coeff. of Expansion $\times 10^{-6}$	18.4	23.1	23.0	18.4	18.4	25.6	20.6
Thermal conductivity	0.34	0.35	0.31	0.26	0.26	0.18	0.31
Temp. in deg. C. of first melting on heating	545	545	525	575	575	550	485

high temperature strength is satisfactory, it is not much better than the lighter alloy (b), which is to be preferred on general grounds. The silicon alloys are primarily very light (as compared with the other aluminum alloys) and they do not appear to be conspicuously weak at high temperatures. It seems to be found in practice, however, that these alloys are prone to become more plastic than would be suspected from their strength at these same temperatures, and being plastic they are rather prone to distort in running. For this reason they do not find favor as piston alloys. This leaves the 8 per cent copper alloy (b) as the most satisfactory aluminum alloy for pistons.

Of the two magnesium alloys the aluminum alloy is, perhaps, rather the better, and is certainly to be preferred for casting work. This alloy is exceedingly light, and its strength is good, particularly at high temperatures. Altogether, it compares very favorably indeed with the aluminum alloys.

For cast pistons in light alloys, then, the choice appears to lie between the 8 per cent copper-aluminum alloy and the 6 per cent aluminum-magnesium alloy. Where initial cost has to be taken largely into account, the former will doubtless be preferred. Where weight is of supreme importance, the latter material has the advantage.

In the summary nothing has been said about Y alloy. This is not to be taken to mean that the alloy is not a good one, for the account of its properties given above indicates the contrary. On paper, Y alloy is probably the best alloy of all those proposed for pistons, particularly when used in the heat treated and aged condition. At the present time, however, there appear to be difficulties in carrying out the heat treatment satisfactorily on a commercial basis, so that the alloy has to be considered in the as cast (or cast and annealed) state. Even then it is quite as good as any of the other alloys and rather better than most. If, therefore, the technique of founding it is improved, and pistons in Y alloy can be turned out with the same satisfaction and regularity as in, say, the 8 per cent copper alloy, it will probably be adopted quite widely.

It should be remembered that the recent competition for the best piston initiated by the German Government resulted in a victory for one made of a magnesium alloy.

Design Changes Exhibited at Electric Vehicle Show

SEVEN makes of commercial vehicles and three of industrial trucks are exhibited at the annual electric truck show which opened at the showrooms of the New York Edison Co. on April 19 and will continue till April 26. In addition there are exhibits of storage batteries, charging apparatus, electric motors and controllers, charging plugs, oils, tools, etc. An exhibit not directly in the automotive line but still bearing a relation to transportation is the Stimmell electric winch.

Design of electric commercial vehicles has been standardized probably to a greater extent than that of any other class of automotive products and one does not go to one of these shows with the expectation of seeing radical changes in design. There are, however, gradual changes in practice, and one of the most notable this year is in the line of the Ward Motor Vehicle Co., which has done away with the underslung battery box and now places the battery inside the vehicle body, under and behind the driver's seat. It is claimed that this construction reduces the weight of the truck, increases the road clearance, reduces manufacturing cost and makes the battery more accessible for flushing, etc. A closed body electric truck with the battery under the driver's seat and to the rear thereof is shown by Lansden Co.

A notable feature of the delivery wagon shown by the Ward concern is the front door, which, in conjunction with a combined front bumper and step, gives ready access to the driver's compartment and is claimed to materially economize the time of the driver. One-half of the dashboard and windshield are mounted on hinges and form a door, and instead of entering the cab from the side, as is the usual custom, the driver enters from the front. This is facilitated by the front bumper acting as a step. This bumper consists of a wooden plank extending the width of the chassis, which is supported by a drop arm from each of the front spring horns and is further connected to the frame by strap steel stay bars which would take the greater part of the impact in case of a collision.

In former years both passenger cars and trucks were exhibited at this show, but it appears that the passenger car branch of the electric vehicle industry has withdrawn from the event.

Following is a list of the makers of electric trucks represented at the show: Autocar Co., Commercial Truck Co., Lansden Co., O. B. Electric Vehicles, Walker Vehicle Co., Walter Motor Truck Co. and Ward Motor Vehicle Co. Industrial electric trucks of the following makes are on exhibition: Baker R & L, Yale & Towne and Eleveyor.

Charging equipment is shown by the Sarvas Co. (representatives for the Westinghouse Electric & Mfg. Co.), Allen-Bradley Co. and the Cutler-Hammer Mfg. Co. Storage batteries are exhibited by the Electric Storage Battery Co., the Gould Storage Battery Co., the K. W. Battery Co., the Philadelphia Storage Battery Co., the Westinghouse Union Storage Battery Co. and the Edison Storage Battery Co.

Among the means of propaganda employed in connection with the show is that of assigning one day to each of the industries or trades chiefly interested in electric trucks and delivery wagons. Thus, Saturday, the opening day, was Warehouse Day; Monday, Department Store Day; Tuesday, Laundry Day; Wednesday, Public Service Day; Thursday, Bakery Day; Friday, Ice Cream and Dairy Day, and Saturday, Provision Dealers' Day. The management of the show collected information regarding the use of electric vehicles in the transportation services of all of these industries, the relative cost of transportation in each line, etc., which it had available for interested parties on the respective days.

A TORQUE dynamometer suitable for laboratory work or high speed engine testing has been developed by the Westinghouse Electric & Mfg. Co. The unit is rated at 30 hp., 2000 to 2500 r.p.m., 230 volts direct current, and is adapted for use at lower speeds, constant torque, by separately exciting the fields from a 230-volt supply. The dynamometer consists of a direct current machine with rolled steel frame mounted between two pedestal type ball bearings. Bracket bearing housings on the machine are extended through the pedestal bearings supporting the entire machine on large ball bearings. With this construction the total torque load is transmitted to the dynamometer arm except for a very small windage loss for which a correction curve can be provided.

Many English Bus Regulations Can Be Used to Advantage in United States

Ten inch ground clearance for every part of vehicle except the wheels required in Great Britain should be adopted here, thinks axle company executive. Independent braking systems advisable.

Editor, AUTOMOTIVE INDUSTRIES:

In several issues of AUTOMOTIVE INDUSTRIES there have been references to the specific restrictions imposed by municipal authorities in London covering the design and operation of taxicabs, buses and trucks. A great many rules and regulations in our own country have been adopted wholesale from English practice and there is no question about the advisability of adopting many English laws, which have been worked out as essential to the well-being of the people through a longer experience than is possible in this country.

Buses have only recently been introduced into our large cities, with the exception of New York City, and there has been very little attempt to regulate either their design or the operation. This freedom from interference may develop certain types of bus and certain methods of bus operation superior to that which has grown up in England under definite restrictions, but, on the other hand, it is possible to give the bus designer and bus operator so much freedom that he will overlook certain essentials, such as the welfare of the general public. Any city contemplating the introduction of buses should at least make a study of the regulations which are in force in England and adopt such regulations as seem essential to the safety of the general public.

Buses Promote Safety

It is possible to operate buses in crowded thoroughfares more safely than street cars. The street cars, operating on tracks in the middle of the thoroughfare, take on and discharge their passengers directly into the path of other vehicles, and which ordinarily are forced by law to pass on the right-hand side between the vehicle and the sidewalks.

Buses operate close to the curb so that passengers not only can step safely to the curb without danger of other vehicles, but also can avoid walking across streets which are frequently dirty as well as dangerous.

It is customary to force all other traffic to refrain from passing the street car while it is taking on or discharging passengers. This increases congestion and works a considerable hardship on the public. The bus avoids this trouble and, from the standpoint of convenience and safety in this particular, will be welcomed in the big cities.

The pedestrian knows that street cars are confined to their tracks and in crossing the street does not have to dodge if he is willing to take his time. The bus, with its ability to run all over the street, is much more likely to knock down pedestrians, and, therefore, the regulation adopted in London, that there must be at least 10 in. ground clearance of every part of the vehicle except the wheels, is necessary and essential to the public's welfare.

Adequate Clearance Used

The object of this ruling is to avoid further injury to a person who has been knocked down and gotten under the bus. It is obvious that the bus, with only 3 or 4 in. clearance (as will be seen frequently in some of our large cities) is not only a menace to the pedestrian, but also may bring about serious accidents by striking ordinary road obstructions, such as man-hole covers or culverts. It would seem that the trouble in operating a bus where snow is frequently encountered during hard winters would make this matter of road clearance of considerable importance to the operator. There are many reasons for the designing engineer, the operator, the passenger and the public official to insist on this 10-in. clearance.

Another regulation in London has demanded two independent braking systems, each capable of holding the vehicle under all conditions and at least one of them applied by foot pedal. Two sets of brakes, working on the same set of brake drums, do not meet the requirement. One set of brakes must act on the road wheels without being dependent in any way on the propelling gears and shafts. In many of the large cities where buses are now operating it will be observed that the operator finds it necessary to use both the foot and hand brake to bring the vehicle to a quick stop. As it is a simple matter to put two sets of drums on the rear wheels or one set of drums on the rear wheels and use a propeller shaft brake, this rule, requiring two independent sets of brakes, should be enforced and recognized by all interested parties.

Regulations concerning noise have been enforced in London and have resulted in considerable improvement in bus design. Some bus designers and operators still might be using the chain drive and the conventional form of internal gear if they had not been forced to abandon these types of drive by the municipal authorities.

The railroads and other public utilities have been put through very severe ordeals and have been handled unmercifully because the public believed they were operating selfishly and very largely in opposition to the public's good. If the bus interests do not wish to be put in the same class they must work together to eliminate every possible source of complaint and give the public satisfactory service. This will not be very hard to do in view of the low standards which have existed in other forms of public transportation.

The bus has justified its existence in some localities, particularly where there have been no satisfactory existing means of transportation. When the bus gets into competition with the older forms of transportation it must be operated at its highest efficiency in order to maintain its existence and justify the replacement of the older transport units.

The bus can never replace the railroads, but it can replace many other types of passenger transportation on the grounds of economy, convenience and safety.

W. F. ROCKWELL,
General Manager, Wisconsin Parts Company.

Commercial Treaty Affects Trade

Editor, AUTOMOTIVE INDUSTRIES:

Last November the Commercial Treaty of Spain with the United States expired and a prorogation was obtained which held the Treaty over for six months. Previous to this prorogation it was not known whether or not we should be successful in obtaining a new Treaty, and for that reason automobile buyers in Spain became alarmed and made rather heavy purchases.

The result of this increase of automobiles imported was not altogether satisfactory in that shortly after that time American manufacturers changed their models, thus leaving Spanish importers with a large stock of old designs. In spite of this handicap the situation was very well handled. The overstock is practically exhausted and the new models are slowly finding their way into this market.

When faced with the expiration of the Treaty in May of this year, it is quite probable that Spanish importers of American automobiles will not repeat their mistake.

The decreasing value of the peseta in relation to the dollar is another factor which is tending to limit sales. This is particularly true as far as the more moderately priced American automobiles are concerned, the reason being that competition is very strong in these lines.

As to the more expensive automobiles, the exchange situation has less effect, since the buyers are usually of the wealthier classes and are not limited in the amounts of money they may wish to spend for a new car.

In the event the United States and France find themselves without commercial treaties with Spain, Italian, German and British manufacturers are sure to prosper in this market, the former two because they are favored by exchange and England because her commercial treaty with Spain will give her most favored nation treatment until October, 1925.

American manufacturers are particularly fortunate in Spain in having real live dealers who are doing all in their power to push their sales and are carrying on extensive advertising campaigns as well as adapting their machines to the needs of the Spanish market.

There has been considerable skepticism as to such a great production continuing, especially after the records made during this past year. As to the future of American automobiles in Spain, there seems to be one matter which should be brought before American automobile manufacturers; the French have proved that there is a great advantage in adapting the manufactured product to the market for which it is intended.

It seems that the Spaniards, when they buy an automobile, are very much like a woman who buys a new hat. Oftentimes they do not seem to be as much interested in mechanical advantages as in the beauty of the lines and in the distinctive characteristics. They are much less interested in the particular make of the car than in possessing one which is totally different from that of their neighbor's. It is a common occurrence to see a well known American make camouflaged with a Rolls-Royce radiator, special mud guards and a huge searchlight or two.

JAMES G. BURKE,
Assistant Trade Commissioner in Charge, Madrid, Spain.

Suggestion to Manufacturers

Editor, AUTOMOTIVE INDUSTRIES:

Why does not some enterprising manufacturer make an air check valve out of the same material used in motor exhaust valves so that a unit will last long enough to pay to put it in?

The common brass checks, which are the only ones in market so far as we know, do not stand up under the severe pounding they get in an air line.

W. O. ROBINSON,
Robinson Auto Co., Tyndall, S. D.

Improving Engine Economy

IN a paper recently read by L. Murphy before the Institution of Automobile Engineers, the use of a very small gasoline engine (61 cu. in. displacement) in conjunction with a standard series-wound electric motor on a 3-4 ton truck is suggested as a means toward more economical operation. The engine referred to is the standard size used on large motorcycles. It would be connected to the electric motor through a friction clutch, and its power would be transmitted to the driving wheels without being converted into electrical energy. A storage battery of adequate size is to be carried, and to be recharged from central stations at intervals, but it is claimed that with the small engine assisting the electric motor in propelling the truck, the mileage on a single charge would be increased substantially in the proportion of 3 to 1.

The engine would be operated on fixed throttle at practically maximum torque at all times and speed control would be effected by varying the field connections of the electric motor. Under these conditions the engine operates under the most efficient conditions and it is figured that 125 ton-miles could be obtained per Imp. gal. of fuel consumed (equivalent to 100 ton-miles per U. S. gallon). In addition to trebling the mileage per charge, the addition of the gasoline engine to the powerplant would result in a considerable increase in the speed of the truck—from 10.5 to 22.7 m.p.h. on the level and from 4.1 to 4.4 m.p.h on an 8 per cent grade, according to the calculations of the author.

One thing that it is well to remember in connection with schemes of this sort is that the ordinary automobile engine cannot be used to run at full throttle continuously, as its bearings are not properly proportioned for that purpose. An engine for such work would have to be specially designed as a heavy duty type.

New Method Devised to Determine Magnetic Properties of Steels

Two chief types of direct reading testing equipment in use. Special merits claimed for instrument recently developed by British scientist. Only very small specimens are required.

AVAILABILITY of steels for use in the manufacture of permanent magnets can be determined from the so-called hysteresis loop, a graph which shows the relation between the magnetizing force and the magnetic induction for both increasing and decreasing values of the magnetizing force. If a piece of hardened steel is subjected to a magnetizing force H it will give rise to a magnetic induction B, and if the magnetizing force then is removed the magnetic induction will not drop to zero but will show a certain lower value known as the remanent induction B_{rem}. To entirely demagnetize the steel it is necessary to apply a magnetizing force of a certain value in the opposite direction, this being known as the coercive force.

Thus in testing steels as to their value for permanent magnets many tests have to be made of the relation between magnetizing force and magnetic induction, and this test takes on considerable importance. There are a number of different methods of making this test and several of them were discussed recently in the columns of *Engineering*. One test described by Dr. T. F. Wall is claimed to be particularly suitable in cases where only small samples of the steel are available. This test involves the use of a ballistic galvanometer and is new only in so far as the form of the specimen and the arrangement of the circuits are concerned.

Ballistic Galvanometer Test

In a ballistic galvanometer test a magnetic circuit is provided which consists either wholly or largely of the material to be tested. Interlinked with this magnetic circuit are two electric coils, one an energizing coil and the other an exploring coil, the latter being connected to the galvanometer. The energizing coil is connected to a source of constant potential, and as its resistance can be determined in advance, the amount of current which will flow through it once a condition of stability is reached can therefore be calculated.

From the current flowing through the coil and the number of turns it comprises the magnetized force H can be calculated. While the current rises in the energizing coil the magnetic induction through the magnetic circuit increases and, as a result, an electromotive force is induced in the exploring coil. The latter being connected to the ballistic galvanometer, a current will be set up in the exploring coil and the coil of the galvanometer.

This type of galvanometer is of such design that its movable system has a comparatively large amount of inertia, and in consequence the system has hardly begun to move when the current impulse—which lasts only as long as the current in the exciting coil increases—ceases. Therefore, the swing of the moving system of the galvanometer integrates the whole effect of the current impulse and is a direct measure of the magnetic induction.

In the following are given some extracts from the article by Dr. Wall and from a discussion of that article by E. A. Watson, which throw light on the methods actually used at the present time in testing magnet steels.

In testing permanent-magnet steels, and in particular in the case of the cobalt steels, several of the usual potential sources of error may be neglected, unless, indeed, results of an extremely high order of accuracy are required. Thus the reluctance of the joints at the end of the magnet, if made with a reasonable amount of care, is so low as to introduce only an extremely small error. Again, the magnetic circuit may include an appreciable length of soft iron without introducing any error of appreciable magnitude. This greatly facilitates the design of testing gear which is direct reading and does away with the somewhat slow and unsatisfactory ballistic test.

Two Types of Apparatus

There are two principal types of testing gear of this description in use. In the first the permanent magnet forms a portion of a magnetic circuit comprising a small moving-coil system carrying a constant known current. The moving coil carries a pointer and is controlled by a spring, and its deflection gives the flux passing in the magnetic circuit. In the second the moving-coil system is replaced by a small armature driven at a constant speed and connected to a millivoltmeter, the reading of which is a measure of the flux.

Mr. Watson states that his firm has developed an instrument which is based on the second of these principles. The armature is a disc of soft iron mounted on a bronze spindle and fitted with a bronze ring round its periphery. It runs with small clearance (0.005 in.) between two blocks of "Armco" iron (99.8 per cent Fe), which form the pole pieces on which the magnet rests. One brush runs on the spindle and another on the periphery of the disc. The resistance of the disc and brushes is arranged so as to be negligible in comparison with that of the millivoltmeter employed, and any thermal e.m.f.s are avoided by the correct choice of materials.

By keeping the disc of considerable size the flux density in the air gap is kept sufficiently low to avoid putting appreciable reluctance in the magnetic circuit. Such an apparatus is, of course, much quicker in operation than any ballistic test, as B and H are read directly at any time—the former from the millivoltmeter reading, the latter from the current in the magnetizing coil. It has, however, another great advantage, viz., that it is possible to make automatic compensation for any air flux in the magnetizing coil and also for what may be termed the space flux in the magnet itself, so that instead of reading the quantity $B = H + 4\pi I$, as is usually done, the value of $4\pi I$ is obtained directly. In the very high coercive steels at points approaching saturation the values of B and $4\pi I$ differ appreciably, but it is the value of $4\pi I$ which is generally of most interest.

This compensation is made by interposing a shunt in the magnetizing circuit and tapping off the drop in a portion of it, and opposing it to the voltage induced in the revolv-

ing disc. The voltage induced in the disc due to the air flux in the coil and the space flux in the magnet is proportional to the current in the coil, and so also is the drop in the shunt, and it only requires suitable adjustment of the shunt to make these quantities cancel out when the millivoltmeter reads $4\pi I$ directly. Further, by arranging suitable resistances between the revolving disc and the millivoltmeter, and by using a shunted ammeter for the measurement of H and interposing suitable resistances between the ammeter and the shunt, it is possible to make the instrument direct reading for $4\pi I$ and H over quite a wide range of section and lengths.

Direct Reading Type

The standard apparatus manufactured is direct reading over a range of from 1 to 10 cm³ and over lengths from 6 to 10.5 cm. It is therefore possible to test a sample 1 cm. square by 6 cm. long, which involves but little steel. The error due to the coercive force of the instrument itself is 16 cgs units. For a specimen 6 cm. long this corresponds to $H = 2.67$, which is practically negligible on a steel of coercive force of 200 or so. Even this, however, is easily allowed for, as it only requires to be subtracted from the observed value. The error in B_{rem} due to the reluctance of the joints and apparatus is less than 1 per cent if reasonable care is taken in fitting, *i.e.*, if the specimens are ground on the ends on an ordinary surface grinder. This also can be allowed for, if necessary, by slight extrapolation of the $B\,H$ curve.

The method described by Dr. Wall, and which is said to be specially applicable to tests where the magnetizing force does not exceed 2000 gauss, makes use of specimens in the form of a hollow cylinder of 7/16 in. inside and 5/8 in. outside diameter and 1 in. long. This specimen forms a closed magnetic circuit and is wound with two coils of 40 turns of double cotton covered magnet wire each, one being the magnetizing coil and the other the exploring coil. In order to obtain a magnetizing force equal to 2000 gauss, it is necessary to send a current of 168 amperes through the magnetizing coil. Such a large amperage necessarily can be maintained for only an instant in a coil of such small wire as can be got on the ring described.

To provide against the burning out of the coil it is immersed in a bath of oil and a special switch is arranged so that the search coil may be short-circuited immediately after the galvanometer discharge is complete and the exciting circuit may then be broken without affecting the continued swing of the ballistic galvanometer.

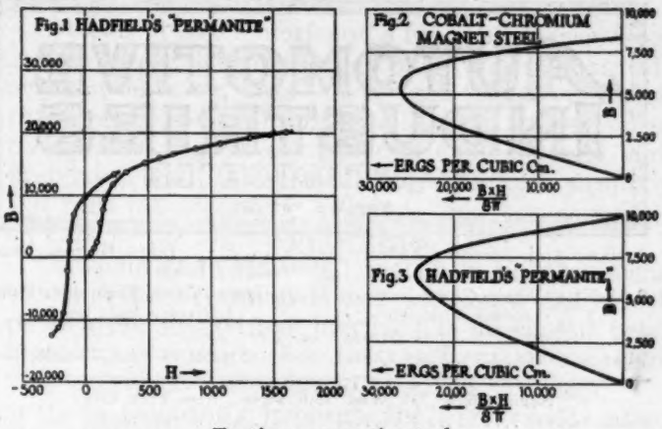
Determining Merit

It has been shown by Evershed that the proper criterion of merit of permanent magnet steels is the maximum value of the product $B \times H$ (magnetic flux times magnetic field strength) as obtained from the demagnetization curve. If the maximum value of this product be divided by 8π the result is the maximum available energy in ergs.

Several curves showing the magnetic qualities of permanent magnet steels on the British market, which were plotted from data obtained by Dr. Wall by the method developed by him, are reproduced herewith.

In Fig. 1 are given the B-H curve and the demagnetization curve for Hadfields' brand of permanent steel known as "Permanite," the test having been made for values of the magnetizing force up to 1600 gauss. For this sample the value of the remanent induction density was $B_{rem} = 9800$ and the coercive force $H_c = 138$.

In Fig. 2 the values of $B \times H \div 8\pi$ are plotted as a function of the induction density B for the whole of the demagnetization curve, and it will be seen that for this sample of cobalt-chromium steel the maximum available energy is about 26,200 ergs per cubic cm. The coercive force is $H_c = 180$ gauss, and the remanent induction density is $B_{rem} = 8300$ lines per sq. cm.



Testing magnetic steel

In Fig. 3 the values of $B \times H \div 8\pi$ are plotted as a function of the induction density B for the demagnetization curve, and it will be seen that the maximum available energy of this steel is about 24,400 ergs per cubic cm.

Crystallizing Lacquer Has Many Uses

A CRYSTALLIZING lacquer made by the Hilo Varnish Corp. of Brooklyn, N. Y., is being used for the finishing coat on visors and other body hardware. This lacquer produces a mottled effect which in some ways resembles certain finished surfaces used on leather. It is made in clear and black. The clear can be applied over a color which will show through the crystals.

This product can be used on almost any clean nonporous surface, and is applicable to all metals, wood which has first been enameled, painted, varnished or shellacked, fiber, wood, paper, etc. On account of its slightly rough and mottled texture it tends to hide irregularities and small imperfections in undercoatings so that less care is required in application of the under coats. The surface, being slightly rough and without luster tends to absorb rather than reflect light. For this reason it is especially suited for finishing the under surface of visors and the exposed surface of instrument boards.

The finish is said to stand up well under handling and exposure to the elements. It is applied in the same manner and is similar to varnish in its composition, but, in order to form the crystals, must be dried in an oven in which the atmosphere is vitiated by products of combustion. Small articles can be placed in any closed receptacle in which even a candle is burning. In larger ovens a small gas flame is employed, or a room in which an oil lamp is burning with doors and windows closed produces the desired results. Drying can be accelerated by baking when desired.

THE Automobile Manufacturing and Trading Company "Autopromtorg" has submitted to the Commercial Council of the Soviet a draft of a plan for the manufacture of automobiles in Russia. According to the plan there would be required 1,000,000 gold roubles of fixed capital and 4,000,000 gold roubles of operating capital. In the first place the two Petrograd works of Amo and Renault would be placed in operation and a special stock company for automobile manufacture would be organized.

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Home Office, 239 West 39th Street, New York City
Cable Address.....Autoland, New York
Telephone.....PENnsylvania 0080 New York

BRANCH OFFICES
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Service First!

KEEPING more than 15,000,000 cars and trucks in operation is a big job. It has to be done in a big way if success is to be achieved. Minor enmities and quibbling over words must be dispensed with to formulate a broad plan for automobile maintenance which will result in giving to the car and truck user the best possible service. Service to the user is the standard by which every plan ultimately must be judged.

This holds true of parts distribution as well as of other phases of the maintenance problem. The vehicle owner is certain, in the long run, to buy replacements parts at the most convenient place and at the cheapest price so long as he obtains units of good quality. He will be the judge in the final analysis of the efficiency or lack of efficiency of any system and the arbiter of relative quality.

No feature of the service question is more puzzling nor more important at the present time than that of parts distribution. Replacement units reach the car owner through various channels. Each channel has some advantages over every other and exists because of some special function. Whether all means used at present will continue forever or whether major changes are to be expected is difficult to predict. But one point is perfectly clear. All phases of the industry must work together to develop the plan which will serve the vehicle user better than any other.

The Automotive Equipment Association, whose members are vitally concerned with the parts problem, have appointed a special committee whose purpose is to confer and cooperate with representatives of the car manufacturers in an effort to iron out differences of opinion concerning methods of parts distribution and to devise the best means for handling this work to the mutual advantage of all concerned.

This effort to bring about a better understanding of a difficult service problem should be welcomed by progressive car manufacturers. The committee appointed by the car builders should include in its personnel a group of prominent, capable executives who are recognized as thoroughly representative of the vehicle industry as a whole. An opportunity is offered to accomplish some really constructive work which should result in dollars and cents benefit.

Ford Does It Again

PRECEDENTS never seem to stand long in the way when Henry Ford decides to do something with which they conflict. If time worn methods used by an industry interfere with the results which he seeks to obtain he does not hesitate to change those methods. The mere fact that things heretofore have been done in a certain way is no reason why they should continue to be done in the same way, especially when the old way is evidently wasteful.

This fact is well illustrated in the announcement that the Ford Company has made radical changes in the methods of cutting lumber used in body construction. It has been customary heretofore to square up and kiln dry practically all lumber used for building bodies before the pieces actually used in the body are cut to size, but since trees do not grow with trunks of uniform diameter and are not exactly straight, the squaring-up process results in much trimming and cutting with the consequent waste of great quantities of valuable material.

Furthermore, the drying and shipping of the lumber before it is cut to size results in waste in fuel, kiln capacity and unnecessary freight charges. What is of still greater moment, the waning supply of hard wood for automobile body construction has long been a cause for apprehension on the part of all large users of this material. Small wonder, then, that the Ford organization decided to eliminate as much waste as possible.

Fortunately, in this case, Ford controlled not only the forests, but all the plants in which milling operations are carried on, so that it was less difficult to overcome the human inertia which usually is a serious obstacle to change in such cases.

In announcing what has been accomplished in this case, Ford very properly points out that all large

automobile manufacturers as well as the furniture and other industries can effect savings similar to that which he has effected by arranging to have the parts which they use cut at or near the source of supply and before the waste of cutting into parallel edge lumber has been incurred. In these times of increasingly keen competition, the automotive industry should not be slow to avail itself of such economies.

Men Wanted

BACK in 1919, in an S. A. E. presidential address, Charles M. Manley predicted that within ten or, at most, twenty years, there would be more engineers engaged in the operating and maintenance end of the automotive industry than in manufacturing and designing work. This prophesy seems well on its way toward fulfillment. Every year more trained men are being required to operate the fleets of vehicles used for commercial purposes and to keep in repair the cars going into service all over the world.

Even those engineers whose chief interest centers in designing are finding it necessary to investigate more closely the problems encountered after the car has been put to work. The Metropolitan section of the S. A. E. has built a whole series of successful meetings around this very idea. Service, operating difficulties, and other questions met by the man who uses the motor vehicle have been discussed from various angles. Everybody has been interested and the car and truck representatives have learned some very pertinent facts about what the user thinks is a good vehicle.

For maintenance and operating work a complete technical training is not so much a necessity as is an ability to think like an engineer. The widespread attention which is being given to problems of the user should result in the rapid development of men capable of handling the increasing burden of service work. Development of such men is of vital importance to the vehicle manufacturer because the treatment received by his product once it leaves the dealer's hands affects materially its ability to fulfill the performance promises made for it by the salesman.

Make Lubrication More Convenient

ALTHOUGH chassis lubrication has been made much more convenient in recent years it cannot be denied that few owners relish the job of applying either grease or oil to a dozen or two individual points on the chassis even as often as once a month. It is not a pleasant task at best and often is turned over to some service station whose employees are likely to do an indifferent job of lubricating. Even then the operation often is too long deferred.

It is to be hoped that ultimately all cars will have chassis lubricating systems which are as convenient, so far as the user is concerned, as is that of the modern engine, and there seems to be no good reason why this cannot be brought about.

Systems in which lubricant is fed to all chassis bearings through tubes radiating from a central reservoir or pump have not been widely used to date, although they appear to have considerable merit. They suffer the disadvantage of complication and relatively high first cost, but if they serve their purpose properly this need not necessarily preclude their use, especially on cars in the higher price class.

Convenience to the user is not to be lightly considered and there certainly is more likelihood that he will press a plunger forcing lubricant to all chassis bearings, say once each time the car is taken out, than that he will give attention to a score of bearings.

If, as frequently happens, the user would rather put up with numerous squeaks and rattles and ultimately pay a goodly sum for replacement of parts which have worn rapidly because he preferred not to bother with lubricating them, is it not reasonable to suppose that he will pay initially a few dollars more for a lubricating system which demands practically no attention on his part and avoids numerous later service charges?

Headlamps Affect Safety of Driving

STEEL which is so thin as to be characterized as "tin" now is being used widely as the material from which the shell, reflector and other parts of headlamps used on many of the lower-priced cars are made. This is done chiefly to lower first cost which is highly commendable providing the cheapening process is not carried so far as to render the finished article unsuitable for the performance of its function.

This limit has been reached if not exceeded in some designs with the result that the lamps soon rattle loose, get out of adjustment and fail to stay put, even after considerable time is spent in their adjustment. If rivets pull out, reflectors lose their proper shape and sockets do not hold the lamp in correct relation to the reflector, the lamp soon fails to fulfill its function.

In its effect upon safe driving the headlamp is second only to the steering gear and braking system and it should be considered primarily from the standpoint of safety when it is purchased and installed. Probably the purchasing agent who buys a "tin" headlamp has but little idea that his order may result in the death or serious injury of many people, but this is precisely what happens sooner or later when factors bearing upon safety habitually are neglected.

The Lighting Committee of the Eastern Conference of Motor Vehicle Administrators complains that car builders demand such low-priced lighting equipment that the lamp manufacturers cannot design and supply lamps which are capable of standing up in normal service. Unless higher standards are adopted in this respect laws are quite likely to be enacted which will require State inspection and approval of lighting equipment.

In justice to the public, to their customers and to themselves car manufacturers should take this matter in hand and see that a solution satisfactory to all concerned is arrived at as speedily as possible.

G. M. C. Publishing Quarterly Earnings

New Policy Adopted — Report Shows $19,280,000 Earned First Three Months

NEW YORK, April 22—A new policy —that of publishing its quarterly earnings—has been adopted by the General Motors Corp. This announcement was made today following the meeting of the board of directors, the first statement made by President A. P. Sloan, Jr., showing that the earnings for the first quarter are practically the same as for the first period of 1923. In the first three months of this year the preliminary estimate shows $19,280,000 in comparison with $19,406,000 last year.

Expects Record Spring

President Sloan also tells of business lost last year because of production being behind demand and of how this year the various units have been operating at a high rate to stock dealers with enough cars to meet the demand. He estimates that although last year's consumer demand in the spring was a record, this year it is equal to it and probably 10 per cent greater.

In his statement Mr. Sloan says:

The final figures for the first quarter of this year will not be available until later in the week, but preliminary figures indicate that net earnings available for dividends, after reserves for depreciation and taxes, are $19,280,000, which compares with $19,406,000 for the corresponding period a year ago. After deducting $1,731,000 covering dividends on preferred and debenture stocks there remains a balance of $17,549,000 available for common stock dividends. This is equivalent to 85 cents on the common stock for the first quarter, or at the rate of $3.40 per annum, but does not include our proportion of Fisher earnings in excess of dividends paid.

In the first quarter there were sold 212,572 cars and trucks as compared with 176,258 cars and trucks in the first quarter of 1923.

Buying Getting Under Way

Consumer demand in the spring of 1923 exceeded all previous records and this year is equal to and probably 10 per cent greater than last year. Due to unseasonable weather, what is termed the spring buying, is just getting well under way. We lost business last year by not having sufficient cars in the field. To avoid repetition of this condition the corporation changed its policy and ran its plants at a peak during the past winter and this spring in order that dealers and distributors should have a sufficient supply of finished cars to meet this spring demand.

This having been accomplished the plants of the corporation are now being operated at a rate equal to slightly over 80 per cent of the sales for the first quarter. It will be noted that this policy of running the plants at peak during the winter and spring enables the corporation to supply the dealers and distributors with sufficient cars to meet spring requirements and to slack off its operations during the summer months to that point necessary to cover the lesser demand for automobiles during that season of the year.

The directors have declared for the second quarter a dividend of 30 cents a share on the common stock, no par value, payable June 12 to stock of record May 19. They also have declared $1.75 a share on the 7 per cent debentures, $1.50 a share on the 6 per cent debentures, and $1.50 a share on the 6 per cent preferred, payable Aug. 1 to stock of record July 7.

Business in Brief

NEW YORK, April 21—No less an authority than Andrew Mellon, Secretary of the Treasury, holds that although present business is at an ebb, yet the condition is not highly consequential. Others of his colleagues in the Cabinet regard present business conditions as good in that the stocks held by most retailers are low and their replenishment imminent.

Other reports broadcast by authorities who watch conditions carefully declare that political phases account for the present hesitation, conditions being declared irregular. Their readings indicate that wholesale trade and industry, except building, are quieter, with buying cautious and conservative. There seems to have been a general slowing down in most of the leading branches of manufacture, including even steel mills, which complain of a decrease in new orders. Better weather and Easter have helped the retail trade, however.

Car loadings again showed a drop, reports for the week ending April 5 being 862,096 compared with 907,548 the week before. However, this count is about on a par with the same week a year ago, which had 896,375. For the first fourteen weeks of the year the total of revenue freight was 12,449,370, compared with 12,213,245 in 1923.

Crop reports state that winter wheat has been helped by improved weather, with spring wheat seeding well advanced. Oat seeding is progressing more rapidly and corn planting is also good.

Bank clearings are better, the check-up in the leading cities showing a gain of 11.3 per cent for the week ending April 17 over the preceding week and 5.2 per cent gain over the same week a year ago. The total was $8,512,181,000.

Bear attacks caused additional sharp losses in the stock market, there being little evidence of aggressive support. Bonds were active, money easy and European exchanges higher.

Marine Act Section Effective June 20

Interstate Commerce Commission Issues Order Postponing Date from May 20

WASHINGTON, April 23—The effective date of Section 28 of the Merchant Marine Act of 1920 was delayed from May 20 to June 20 by an order of the Interstate Commerce Commission issued at the conclusion of three days' hearings. The action was taken to give rail carriers sufficient time in which to adjust their schedules so that the rates which will be put into effect to carry out the provisions of the section will conflict as little as possible with the Interstate Commerce Act.

The order was based on representations of the railroads, the National Automobile Chamber of Commerce and other shippers throughout the country that application of the section would create preferential rates and discriminations against various ports and between certain goods.

Railways Made Protest

One of the strongest protests came from the railway representatives, who told the Commission that, under the interpretation of the Act, which does not affect commodities moving through Canada, a very material loss would result to American-owned railroads, by shippers routing their shipments through Canada to New York ports.

Under this ruling, representatives of the N. A. C. C. testified before a House committee that more than 90 per cent of the automobiles shipped abroad would move by way of Canada and would be left free to be carried in either domestic or foreign ships.

Charges that the Shipping Board was not warranted by the facts in certifying that there is sufficient American tonnage to handle American foreign trade were made by representatives of shipping and port interests from all sections of the country at the Interstate Commerce Commission hearing.

Say Hardship Would Result

Early operation of the section, which would require through rail-and-water rates for commodities moved in American bottoms, would work extreme hardship on every port in the country, except New York, it was asserted, and would divert a large tonnage of American trade to Canadian railroads and ports.

In granting the thirty days' delay, the commission held that the law restricts its duties to administration, and that it has no power to question conditions in the shipping industry as represented to it by the Shipping Board. The Shippers asked that an extension of six months be made in order that the effects of Section 28 might be studied and

(*Continued on page* 946)

Transport Congress Sessions Arranged

First Will Be Held on May 21, with John N. Willys, Committee Head, Presiding

NEW YORK, April 22—A tentative program for the World Motor Transport Congress, to be held at the Hotel Statler in Detroit May 21-24, under the auspices of the National Automobile Chamber of Commerce, has been prepared by the Foreign Trade Committee, which is in charge.

As the program is announced by Secretary George F. Bauer, the Congress will be a most pretentious affair, bringing together from all parts of the world people who are interested in motor vehicles and transportation.

Among the speakers listed are men of prominence, including John N. Willys, A. R. Erskine, E. S. Jordan, F. J. Haynes, Roy D. Chapin, A. J. Brosseau, H. H. Rice, Alfred Reeves and J. Walter Drake.

The program is as follows:

WEDNESDAY, MAY 21

Automobiles and Motor Trucks Session

John N. Willys, chairman, N. A. C. C. Foreign Trade Committee, presiding.

10 a. m.—Welcome of delegates, by chairman.

10.15 a. m.—"The Automobile as an Economic Factor in Progress of Nations," Alvan Macauley, president of the Packard Motor Car Co.

10.45 a. m.—"How is the Automobile Proving Its International Utility?" Discussion led by W. Herman Slade, president of Slade Allan & Co., Sydney, Australia.

11.15 a. m.—"The Stimulus of the Motor Truck to Development of World Industries." T. R. Dahl, vice-president of the White Motor Co.

11.45 a. m.—"Adjusting the Motor Vehicle to Railway Requirements." Discussion led by Sir Henry Worth Thornton, K. B. E., chairman of Board of Directors and president of the Canadian National Railways.

Luncheon in Honor of Delegates from Asia and Australasia

12.30 a. m.—Informal discussion by delegates will regard automotive problems confronting countries in Asia and Australasia and means for solution.

Automotive Vocational Tour

2.30 p. m.—Delegates from abroad will be shown installations of motor vehicles in variety of industries in and near Detroit. Object is to afford ideas on practical uses to which motor vehicles may be put in the United States and with modifications in other countries as well.

Motor Buses and Taxicabs Session

8 p. m.—"The Place of the Motor Bus in World Transportation." S. A. More, president of Selden Truck Corp.

8.30 p. m.—"How are Motor Buses Being Developed to Meet International Needs?" Discussion led by H. Weinberger, representative of A. Fross-Buessing, Vienna, Austria.

9 p. m.—"The Taxicab in Its Economic Sphere," John Hertz, president of the Yellow Cab Manufacturing Co.

9.30 p. m.—"How is the Motor Vehicle Changing Local Transportation?" Discussion led by S. Audi, president of S. Audi & Freres, Beyrouth, Syria.

THURSDAY, MAY 22

Business Promotion Session

Percy Owen, chief of U. S. Automotive Division, presiding chairman.

10.15 a. m.—"Effective Automotive Advertising," Edward S. Jordan, president of the Jordan Motor Car Co.

10.45 a. m.—"Adaptation of Automotive Advertising to Local Needs in Different Countries." Discussion led by Paul Cousin, representative of Chambre Syndicate des Negociants en Automobiles et Accessoires, Bruxelles, Belgium.

11.15 a. m.—"Planning and Carrying Out the Sales Campaign," F. J. Haynes, president of Dodge Brothers.

11.45 a. m.—"What Automotive Selling Methods are Successfully Employed in Different Countries?" Discussion led by F. F. Fairman, representative of the American Chamber of Commerce, Shanghai, China.

Luncheon in Honor of the Delegates from Americas

12.30 a. m.—Informal discussions by dele-

(*Continued on page 947*)

Industry Should Ship More Than 7 Per Cent of Output in Building Up Trade in Foreign Fields

AN INTERVIEW WITH PERCY OWEN,
Chief of the Automotive Division of the Bureau of Foreign and Domestic Commerce

By D. M. McDonald,
Detroit News Representative of the Class Journal Co.

Detroit, April 23.

WITH only approximately 7 per cent of its total output going to foreign markets, Percy Owen, new chief of the automotive division of the Bureau of Foreign and Domestic Commerce, wants to know whether the industry is of the opinion that it is looking after its interests abroad properly and whether it is taking the proper steps to build up its foreign business to proportions that are truly representative not only of its size but of the importance of foreign markets.

Seven per cent, in Mr. Owen's judgment, is a very low figure to be satisfied with, especially in view of the fact that other American industries, in what might be termed allied lines, are doing an export business that literally dwarfs the shipping done by automobile manufacturers. This is especially true, said Mr. Owen, when it is considered that the same if not greater opportunities are awaiting the automotive industry than the manufacturers in other lines are accepting.

It is true, Mr. Owen said, that up to the present the condition of the home market has been such as to require practically all of the output of the industry's factories, but now, he declared, with vastly increased capacity and the immediate requirements of the United States fairly well caught up with, much more time and study should be given to the world markets than has been the case up to now. It is not so much a question of spending money on foreign market development as of giving it time and attention, he stated.

The pressing need of the present time, Mr. Owen said, is for the presidents and general managers of the big automotive companies to get behind their foreign sales representatives and give them every assistance in laying out definite and comprehensive plans for reaching the great and practically untouched markets abroad. There is probably more need for transportation in practically every country than there was in the United States when automobiles were first introduced, he stated.

Here in the United States we have come to recognize the automobile as probably the greatest single element in the development of better general conditions that has been evolved in the last forty to fifty years, he said, and this view is shared by thinking people throughout the world. Economic conditions in the United States were not such at the time the automobile was first introduced as to provide a market for the sale of 15,000,000 to 20,000,000 cars, but the automobile itself has corrected these conditions and developed the market to its present huge proportions.

This same history of growth can be recorded in practically every country of the world, said Mr. Owen. He cited the interest that is being shown in even what are regarded as the most backward of these, not only in automobiles but in all modern mechanical developments and methods. The seed has been planted in practically every country and it is bearing the fruit of continuously greater interest. Barriers that have existed for thousands of years are gradually giving way before the demonstrations of efficiency of modern methods.

Lack of roads in some parts of the world presents a barrier to immediate automobile market development, said Mr. Owen, but the industry does not have to go to countries that have poor roads or no roads at all. There are plenty of places where there are roads to present a large and profitable market. Poor financial conditions in some countries offset the possibility of immediate markets but there are countries where finances are good. Some countries need cars and not trucks, others trucks and not cars, he declared, but everywhere, all over the world, there are possibilities of some business if the proper steps are taken to get it.

Committee to Form Plan for Lexington

Failure of Company to Meet Interest on Bonds Brings About Its Appointment

NEW YORK, April 21—A reorganization of the Lexington Motor Co. of Connersville, Ind., which went into a receivership April 28, 1923, is being considered by a bondholders' protective committee, which has been formed by holders of the first mortgage and collateral trust 7½ per cent bonds.

Whether or not this reorganization is possible has not been determined as yet, but at any rate the committee expects to bring about either a reorganization or a readjustment of the situation before Jan. 1, 1925, the time limit set for its investigations.

Failure on the part of the company to pay the interest on these bonds brought about the appointment of the committee, of which Chauncey H. Murphey of the Metropolitan Trust Co. of New York is chairman, and which also includes H. M. Johnson of Connersville, Ind.; Frederick Carles of Philadelphia; William P. Beeber of Williamsport, Pa., and Clark S. Jennison of New York City.

The committee has found that out of the total of $1,500,000 of these bonds, authorized by the company, $561,000 worth was sold. The remaining $939,000 was pledged as collateral security for loans, which, with accrued interest, now amount to approximately. $400,000. The committee believes that a dangerous situation exists, and action is necessary to protect the investments. It is said the Durant interests own the greater portion of the outstanding bonds through the support they gave the Ansted Engineering Co., one of the Lexington subsidiaries.

The formation of the committee is said to be with the knowledge and approval of Arthur Dixon, one of the Ansted receivers. Its powers are broad, and a thorough investigation into the condition of the Lexington company will be made.

Trexler Trustee Named; Business Will Not Halt

PHILADELPHIA, April 22—The Delaware Trust Co. of Wilmington, Del., has been appointed trustee for the Trexler Co. of America, Inc., manufacturer of automobile accessories.

This step followed the action of shareholders, according to H. J. Adair, Philadelphia, president, that will enable the company to continue its business without interruption, following the dissolution of the banking firm of George A. Huhn & Sons, which is now under way.

George A. Huhn, senior member of the firm, is chairman of the board of the Trexler company. The Huhn firm was banker for the Trexler company, which started operations in its plant in Wilmington last year and owns more than 30,000 shares of the company's stock.

AKRON RAILWAY BUYS 28 MORE MOTOR BUSES

AKRON, OHIO, April 22 — Although the city of Akron went back to the trolley after trying 27 days of haphazard motor bus service, yet it is evident that the experience has demonstrated the value of bus transportation.

This is shown by the fact that the Northern Ohio Traction Co. which operates the trolley service of the city, has placed orders for 28 buses, practically doubling the number it uses within the city limits supplementary to street car service.

When these orders are received, the company will operate 58 buses within the city. It also operates, together with a subsidiary company, 20 additional buses at Canton and in inter-city service between Cleveland and Akron.

G. M. C. Not Connected with Insurance Firms

NEW YORK, April 23—Announcement of the proposed organization of two new insurance companies under the insurance laws of the State of New York, with the names of "General Motors Casualty Co." and "General Motors Fire Insurance Co." brings the following statement from the General Motors Corp.:

These two companies are being formed by persons not connected with this corporation.

The use of the words "General Motors" by them is not authorized by us, and, insofar as it suggests that they are in any way connected with this corporation, it is deliberately misleading. The General Motors Corp. is not interested financially or otherwise, nor is it responsible in any degree for the integrity or solvency of either of these companies.

As we have eleven subsidiaries which use the phrase "General Motors" in their names, people will naturally assume that these companies are also our enterprises, and they will be able to trade upon that assumption without doing anything more than taking the name.

We already have pointed out to the organizers of these companies the impropriety of using the phrase "General Motors," and are quite prepared to take whatever action may be necessary to enforce our rights, and to prevent any misconception on the part of the public.

PIERCE-ARROW ELECTION

BUFFALO, April 23—At the annual election of the Pierce-Arrow Motor Car Co. held here the following board of directors was chosen: Col. Charles Clifton, Walter P. Cooke, G. M. Dahl, Joseph G. Dudley, Myron E. Forbes, Lewis G. Harriman, John C. Jay, Jr., J. H. McNulty, Roland L. O'Brian, C. J. Schmidlapp, Albert D. Sikes, Carlton M. Smith and Albert Strauss.

German Car Makers Will Meet Invasion

Benz and Daimler Reported Merged on Eve of Lifting of Embargo on Imports

NEW YORK, April 21—A wireless message from Berlin to the New York *Times* states that the two oldest automobile manufacturing concerns in the world, Daimler and Benz, have amalgamated, the consolidation being brought about in the movement now under way to organize the German automotive industry to oppose the anticipated inrush of American cars when the embargo on imports is lifted.

No further details of the merger have been received here, the Benz importer in this city declaring that he knows nothing of such negotiations and adding that he has heard of none pending.

Several cases have been reported of German car builders banding together to market their outputs through one channel, thus cutting down overhead. It is believed that this reported amalgamation may be something of the sort rather than a merger as Americans interpret an amalgamation.

It is thought that the embargo will soon be lifted, following which it is expected there will be a big fight waged by American manufacturers to get a footing in Germany. Therefore, that German automobile car builders should join forces to meet such an invasion is not surprising.

Halladay Bumper Output Will Reach 3000 Daily

DECATUR, ILL., April 24—The L. P. Halladay Co., maker of shock absorbers and bumpers, which recently merged with the Biflex Products Co. of Waukegan, and has taken over the old Comet Automobile Co. plant for which it paid $125,000, expects within sixty days to establish a production schedule of 3000 bumpers a day, triple the capacity of the Halladay company at this time.

The Halladay plant is so pushed on orders now that transfer of its plant to the Comet Building will probably not take place until late in the summer, L. P. Halladay, chairman of the board, has announced.

The Biflex plant in Waukegan will be continued as at present, inasmuch as the two concerns do not conflict, and the merger will not bring about any changes. The main office of the companies will be in Waukegan but Mr. Halladay will remain in Decatur, where after forty-one years in the manufacturing industry, he plans to take a rest.

A. G. Grim, vice-president of the Decatur company, will operate the local plant, Mr. Halladay retains a half interest in the new Decatur firm, is chairman of the board of directors and also vice-president of the Biflex company.

Sales Keeping Pace with April of 1923

Plant Activities in Early Part of Month Fell Behind Last Part of March

NEW YORK, April 21—Sales of automobiles are reported to be keeping at almost the same pace as at this time last year except in certain sections of the country where local conditions are acting as a deterrent. This is notably true in the California territory, where the farmers have suffered severely and where the absorbing power of the buying public is not as great at the present time as the stocks on hand. In other sections, however, inclusive of the Northwest, where the agricultural situation is not of the best, sales are reported not to be falling far behind the corresponding period of last year.

Buying a year ago started considerably earlier in the season than it did this year. There was a shortage of cars and, as a result, manufacturers were forced to capacity operations in the second quarter. Conditions exactly the reverse prevail this year; buying has started late, there is no widespread shortage of cars and manufacturers, operating at capacity in the first quarter, are not being pressed to maintain operations at top speed in the second.

General Recession in Industry

A few producers are on capacity schedules but there has been a general recession in the industry, this to last until sales pick up to an extent that makes greater activity in producing plants necessary. This recession is affecting allied branches of the industry and has caused a slowing up among parts makers. It denotes merely a conservative policy that was adopted last year and has been zealously followed.

During the first week of April, the industry, taken as a whole, was pursuing the manufacturing pace of the first week of March, but it fell behind that maintained at the close of the month. Operations have experienced a general slowing down since then, although manufacturers are keeping their working forces intact ready to advance schedules at any time. Present retail requirements do not warrant as high operations as were maintained in the months of the first quarter.

Revised figures place the total March output of cars and trucks at 378,000. This is 22,000 more than the estimate made at the close of the month and brings the total for the first quarter to 1,061,583, compared with 875,503 in the first quarter and 1,155,290 in the second quarter of last year. It indicates the preparations made by the industry in the first quarter of this year to meet the spring demand when it came rather than waiting for the demand to come, as was the case a year ago, before speeding up operations.

CONNECTICUT DROPS PARALLEL ROAD PLAN

HARTFORD, CONN., April 21—Instead of building a parallel highway to alleviate congested traffic, which has been suggested, the State Highway Department is planning to widen the Boston Post Road from its present width of about 18 ft. to 36 ft. from the New York State line to New Haven. The Boston Post Road carries extra heavy truck traffic as it is the connecting link between New York City and New England.

New Bureau of Franklin Bridges 2 Departments

SYRACUSE, N. Y., April 21—The Franklin Automobile Co. has formed a new bureau to bridge the gap between the sales and advertising departments through providing statistical information relating to markets, devising and executting retail merchandising plans and formulating sales information.

The work of the bureau will be conducted by three recent additions to the Franklin organization, Clyde Jennings, formerly editor of *Motor Age;* R. A. Rawson, previously special representative of the Chandler Motor Car Co., and Bert Dingley, formerly sales engineer of the Nordyke & Marmon Co. While the work of the bureau is separate and distinct from either sales and advertising, yet it is related to both.

Creditors Buy Realty of Kalamazoo Motors

KALAMAZOO, Mich., April 23—The real estate of the Kalamazoo Motors Corp. has been bid in at public auction for $60,000 by the First National Bank of this city in behalf of the creditors.

The affairs of the corporation came to the attention of the Circuit Court in May, 1923, at which time Judge George V. Weimer appointed John L. Carey receiver. A decree of foreclosure of the mortgage was filed by Judge Weimer, Feb. 11, after hearing in court.

Mr. Carey filed his final account and received his discharge as receiver a few weeks ago. The sale of the property will become final Oct. 15 unless redeemed before that date. The bank acts for the bondholders.

Exhibit to Be Held at Body Convention

If Successful It Will Take Place of Show That Is Usually Staged in New York

NEW YORK, April 21—The annual convention of the Automobile Body Builders' Association will be held in Detroit, June 3 to 4, combining with it an exhibition of body materials and parts in which only members will be permitted to exhibit. If the exhibition proves to be the success anticipated, it will supercede the body builders' show usually held in New York City.

The Detroit Section of the Society of Automotive Engineers will cooperate in the convention, some of its members being booked to read papers of interest to the body building industry. Billed for discussion by the various sections of the Automobile Body Builders' Association are the following subjects:

Items That Should Enter Into the Indirect or Overhead Cost of Making Bodies

Comparative Value of the Different Materials and Methods for a Body Finish

How May a Body Builder Best Establish a Good-Will Among Car Users.

The Effect on Commercial and Bus Bodies of the Reduction in Excise Taxes and What Further Reduction, if any, Should be Planned

Discussion and Adoption of a Code of Ethical Practices

Bus Body Nomenclature

Standardization of Body Hardware

Congressman R. H. Clancy of Michigan will tell the body builders of the fight in Congress to reduce automobile excise taxes, which he has led.

Injunction Holds Up Sale of Southern Motors Plant

HOUSTON, TEX., April 22—Disposition of the buildings of the Southern Motors Manufacturing Co. has been held up through a temporary injunction granted in behalf of the American Trailer & Body Works. The Southern company is in receivership and is being liquidated by Ed. F. Dupree, receiver.

The injunction was granted on the petition that rent due the plaintiff concern has not been paid.

FOX PROPERTY SOLD

PHILADELPHIA, April 24—The property of the defunct Fox Motor Co., consisting of a factory on a lot 530 x 378 ft., has been sold at receiver's sale to an undisclosed purchaser, through Samuel T. Freeman & Co., auctioneers, for $230,000.

GERMANY ADMITS FORDSONS

NEW YORK, April 23—According to an item in a German automobile publication permission has been granted by the German Government for the importation of 500 Ford tractors.

Bus and Truck Gain Predicted by Reeves

Will Be Greater Than in Passenger Car Field, He Tells White Motor Meeting

CLEVELAND, April 24 — Declaring that the coordination of motor trucks with other fields of transportation is fast establishing the highway vehicle in its rightful position in the general plan of transportation, Alfred Reeves, general manager of the National Automobile Chamber of Commerce, spoke enthusiastically on the prospects of the truck and bus at the dinner of the White Motor Co. at the Hotel Cleveland tonight, attended by the company's factory and field organization.

So well does Mr. Reeves think of the outlook for the commercial vehicle that he told the White men he believes 1924 will see a bigger increase in the production of trucks and buses than will obtain in the passenger car field.

Cites Action of Railroads

Dwelling on the rapid strides being made by the truck, he told of the interest in this form of transportation which is being shown by both the New York Central and Pennsylvania railroads.

The former now has more than 30 motor trucks in its service under contract with haulage companies, both to replace l.c.l. package freight trains and to assist in terminal movement, he said, while the Pennsylvania now operates, by contract with haulage companies, some 20 motor trucks in 11 units, displacing 11 local l.c.l. package trains.

At least half a dozen other railroads are contemplating using trucks to replace l.c.l freight trains in much the same way, he declared.

In the bus field, he pointed out that last year there was an increase from 60 street railway companies operating some 300 buses to 128 companies with more than 1200 buses, or an increase of about 300 per cent within a year.

Railways Operate Buses

"Of these 128 street railway companies, 13 have replaced street railway lines with bus operations entirely," he said. "In addition nine electric railway companies are listed by the American Electric Railway Association on March 15, 1924, as planning to operate buses either as feeders, auxiliaries or coordinated branches. Five electric railways operate trackless trolleys. This makes a total of 143 different bus or trolley lines operating in connection with or superseding street railway lines."

Another opportunity for trucks is found in the decision of the Supreme Court of Texas, he said, which has handed down a far reaching decision permitting railroads to discontinue unprofitable branch lines and thus permit the use of trucks by railroads when they are willing to do so. Inasmuch as there are 659 short-line railroads in this country, two-thirds of which have a mileage of 25 miles or less, this decision should count for much with truck makers.

Mr. Reeves, speaking of the action of senators who also are commissioners of the District of Columbia in establishing a weight limit of 28,000 lb. for loaded motor trucks and which is in line with the recommendations submitted by the Bureau of Roads, said that this is the maximum which motor truck manufacturers have insisted should not be exceeded by their customers.

"Overloading is an evil which everyone must battle," said Mr. Reeves. "We need more law enforcement against those who would overload either light or heavy trucks and thus insure the highways.

"In fairness to other highway users only well built trucks with legal width of tires, properly distributed loads and with fair limits on the width of bodies, should be allowed on the highways."

AIR SERVICE BUILDS BIGGEST SIZE TIRE

WASHINGTON, April 23—The largest known tire in the world, measuring 64 x 14 in., is being designed at the Air Service Engineering Division, McCook Field, Dayton, Ohio, it is announced here by the Air Service.

The experimental casing is of the straight side type, and because of its size has necessitated the design of a special wheel upon which to fit it. The estimated weight of the tire and wheel assembly is about 300 lb., and the normal load is approximately 20,000 lb., with an inflation pressure of 75 lb. in the tire.

The estimated breaking load of the wheel is 60,000 lb. The largest American tire heretofore built was 54 x 12 in. and is at present used on the Barling Bomber.

Parts Jobber and Maker Association Is Planned

CHICAGO, April 22—Parts jobbers and manufacturers will hold a meeting in Detroit on Saturday, May 24, to consider organizing a national association. It was planned to launch the association at a meeting in Chicago yesterday, but leaders in the movement wishing to take advantage of the National Automotive Service Convention and Automotive Maintenance Equipment Show, scheduled to be held in Detroit May 19 to 25, decided on the change of date and place.

This move is sponsored by W. D. Patterson, president of Patterson Parts, Inc., San Francisco, a jobbing house.

Headquarters will be established by the parts factors in the Statler Hotel during the equipment show while the organizing convention will be held at some point to be decided later.

Plan for Duesenberg Will Be Worked Out

Committee of Indianapolis Business Men Named by Creditors and Stockholders

INDIANAPOLIS, April 23 — At a meeting of stockholders and creditors of the Duesenberg Automobile & Motors Co. held here Monday, a committee of three prominent local business men who are not financially interested in the company was appointed to draft a reorganization plan as a step in the program to bring the company out of the receivership under which it is now operating.

The plans to be considered are to provide additional working capital in order to meet the demand for products of the company. William T. Rassmussen, receiver, has operated the plant since the early part of the year and has built and shipped cars steadily.

The corporation is said to have assets of $1,358,000, with liabilities slightly in excess of $500,000. Any plan drafted by the committee must be submitted to the stockholders and then to the court.

It is predicted in some quarters that a plan will be worked out and accepted within a month. It is understood that several reorganization offers have already been made.

Chicago and New York Bus Interests Merge

NEW YORK, April 24—It has been no secret that a consolidation of the Chicago Motor Coach Co. and the Fifth Avenue Bus Securities Corp. interests was pending, so it occasioned no surprise today when it was announced that the deal has been completed. Details, however, are not yet ready for announcement.

As stated some time ago, an operating company to be known as the Omnibus Corp. of America, will acquire the assets of the Chicago Motor Coach Co. and, through the latter, a substantial interest in the St. Louis Motor Coach Co. It is expected that Philadelphia will be brought into the picture also, as it is reported that the Fifth Avenue Bus Co., which is an operating subsidiary of the Fifth Avenue Bus Securities Corp., has applied for a bus franchise in Philadelphia.

Another angle is that holders of stock in the New York Transportation Co., which is controlled by the Fifth Avenue Bus Securities Corp., will have an opportunity to participate in the merger of the New York and Chicago companies just announced.

John Hertz of Chicago, head of the Yellow Cab and Chicago Motor Coach Co. interests, is the predominating figure in this big merger, and it is said that his plan is of nation-wide scope, which will make the Omnibus Corp. of America most powerful in the bus field.

Accidents Last Year Caused 15,700 Deaths

But Percentage of Increase Over 1922 Not Up to Growth in Registrations

NEW YORK, April 22—An analysis of the automobile fatalities in the United States in 1923 as made by the National Bureau of Casualty and Surety Underwriters, whose headquarters are in this city, shows that approximately 15,700 lives were lost in motor vehicle accidents, exclusive of grade crossing collisions between motor vehicles and trains. This is an increase of 2000 over 1922. Taking into consideration grade crossing fatalities, this total is increased to more than 17,000.

Percentage to Registrations Cut

There is one bright side to this analysis in that the figures show that, whereas the total number of cars in operation is increasing yearly by millions, yet the percentage of death rate is not keeping up with the registrations. The 1923 death rate per 10,000 automobiles was 10.3 per cent, compared with 24 per cent in 1915.

Each year this percentage has been cut because of the efforts being made to reduce the number of automobile accidents, and results prove that this safety campaign is bearing fruit. It is noted, however, that whereas many cities have worked hard to educate the public in this regard, little work along these lines has been done in rural communities.

A distressing angle of the report is that 32 per cent of the 1923 fatalities were children under fifteen years of age. This percentage applied to the entire country indicates that 5000 children were killed in automobile accidents last year.

This estimate was made for the National Safety Council on the basis of statistics supplied by the health officers of 135 American cities, with an aggregate population as of July 1, 1923, of 30,128,555. The cities range in size from 25,000 population upward and embrace nearly one third of the entire population of the United States.

Method of Compilation

Explaining how it arrived at its conclusions, the National Bureau states:

The 1923 automobile death rate for the 135 cities studied was 13.4 per cent higher than the 1922 death rate for the same cities. Application of this factor of increase to the 1922 countrywide death rate of 12.5 per 100,000 population produces a 1923 countrywide death rate of 14.2.

This death rate multiplied into the population of the United States as of July 1, 1923—estimated at 110,663,502 by the Bureau of the Census—produces a total of 15,700 deaths.

This assumed that the rate of increase in motor vehicle accidents was no greater in rural districts than in cities, which is doubtful, because while many cities have through successful safety campaigns been able to cut down the number of their automobile accidents, no such campaigns have thus far been conducted by rural communities.

The statistics show that for the last three years the automobile has caused more deaths than all other vehicles put together, that is, more than steam trains, street cars, horse-drawn vehicles, bicycles and other means of transportation.

SITE OF TOWN MOVED TO CONCRETE HIGHWAY

RENO, TEX., April 22—Reno, a small community six miles east of Paris, Tex., has reversed the time honored custom of towns following the railroad. Reno has moved away from the railroad to the new concrete highway that runs east out of Paris.

This town on the Texas & Pacific Railroad saw only four trains a day passing through it while about a half mile away a steady stream of traffic was passing over the concrete highway. So the town packed up all of its three business houses and moved over to the highway. Only a swimming pool was left at the old site.

Congestion in New York Increases Use of Horse

NEW YORK, April 24—Major Elihu C. Church of the New York Port Authority, discussing transportation problems confronting the city at a luncheon of the New York Electrical League yesterday, declared that there has been an increase recently in the number of horse-drawn trucks operating in the metropolis.

This, he said, has been caused by traffic congestion which has caused many business houses to go back to the horse. He estimates that, as a result of the congestion, seventy-three out of every 100 trucks entering the city are horse-drawn, and he believes that the congested traffic situation is entailing a burden of $100,000,000 a year upon the city.

Major Church cited one large firm in lower Manhattan which moved to Brooklyn more than a year ago and saved more than $150,000 in its truck haulage in the first year because of better traffic conditions.

FRUEHAUF SUCCEEDS CROW

DETROIT, April 22—H. C. Fruehauf has been chosen by the executive committee of the Trailer Manufacturers Association as president, to succeed M. E. Crow, who has been filling the position temporarily. S. E. Liedabrand of the Automotive Trailer Co. of Springfield, Ill., succeeds Mr. Fruehauf as first vice-president.

PAIGE BROUGHAM $2,175

DETROIT, April 23—The price of the new Paige brougham, which was announced in AUTOMOTIVE INDUSTRIES of April 3, is $2,175 instead of $2,150.

Organizations Unite to Study Accidents

Permanent Committee to Be Formed Under Direction of Secretary Hoover

WASHINGTON, April 23—Under the direction of Secretary of Commerce Hoover, a dozen national organizations, among them the National Automobile Chamber of Commerce and the American Automobile Association, have started the formation of a permanent committee that will study the causes of motor accidents, with a view of making the city streets and rural highways safe.

Tentative selections of committees to study the various phases of the safety problem, with the view of the coordination of programs dealing with street and highway safety measures, has been made here at a special meeting of the representatives of the national organizations.

A suggestion made at the meeting by members of the committee representing the N. A. C. C. that President Coolidge be asked to summon Governors and other State officials and enlist them in the drive for greater safety on the highways is under serious consideration, it is understood.

Following the organization of the permanent committee, it will immediately proceed to compile data already collected by the automobile industry and associations on the causes of accidents. A thorough study of these causes by experts will form the basis for recommendations as to their elimination and for an educational campaign.

Efforts are being made to enlist the aid of nationally known leaders familiar with such studies as statistics, control of traffic, road construction and engineering, city planning and zoning, insurance, education in safety matters and the mechanical equipment of motor vehicles. On completion of studies of these questions, a meeting of all national organizations interested is planned.

Airplanes Will Replace Ocean Liners, Says Pilot

PHILADELPHIA, April 23—Lieut. Roman J. Miller, air pilot of the United States Navy dirigible Shenandoah, predicted yesterday at a luncheon of the Philadelphia Chamber of Commerce that the time is coming when ocean liners will be displaced by airships, which will be more profitable than the present system of water transportation.

Lieutenant Miller says:

When rigid ship construction is standardized at no distant date, 250 passengers can be carried in comfort to London in 50 hours at the outside. We can build 30 like the Shenandoah for the cost of the Leviathan, and they can make two round trips in the time of one ship trip, with a week over for overhauling.

The financial return will be at least 30 per cent greater than with the Leviathan,

Hispano-Suiza Cars to Use Air Cleaner

Next Year's Models Will Show Departure from General European Practice

PARIS, April 12 (*by mail*)—Contrary to general European practice, an air cleaner will be used on next year's models of Hispano-Suiza cars. The breather is placed on the top of the right hand crankcase web, and the air is led to the carbureter through a cleaner in the engine base chamber, thus serving to cool the oil and also affording a clean appearance, for there is nothing external to indicate that an extra appliance has been added.

The decision to use an air cleaner was arrived at after experience with cars belonging to the King of Spain. The royal car was always followed by a second and similar car carrying State detectives, and it was found that this car, running in the dust of the first machine, needed overhauling at very frequent intervals.

The new Hispano-Suiza has a bore and stroke of 110 by 140 mm. (4.33 by 5.5 in.), compared with a bore of 100 mm. on the present model. Among the changes is a very considerable offset of the front axle, the portion of the semi-elliptic springs ahead of the axle being much shorter than that to the rear of the axles. The dash forms a practically airtight joint with the engine base chamber, so that all air drawn in through the radiator has to be discharged laterally through the sides of the bonnet.

Too Many Taxes Already, Writes Iowa's Governor

DAVENPORT, IOWA, April 24—Governor N. E. Kendall hasn't changed his attitude about a gasoline tax bill and in a letter to Senator Holdoegel of Calhoun County, has made some pertinent observations about the proposed 2 cent tax on gasoline for the purpose of establishing a highway fund. The governor wrote:

Reduced to its last analysis, the measure simply advances the price of gasoline to every motor user two cents a gallon. The process by which this is accomplished may be denominated a "license," a "levy," a "privilege" or whatever substitute may be preferred to escape the disagreeable fact that it is a sales tax upon oil employed for the propulsion of automobiles.

Such a tax is offensive to me in any event but especially so at the present juncture, when the people of the State and the country are overwhelmed with the common burdens of Government.

My conclusion is that the entire matter would better be deferred until the general assembly next January at which time conditions may have somewhat improved.

CORRECTION

The Holley Carburetor Co. of Detroit denies that it is paying royalty to the Solex Co. of France or any other concern, as stated in an article from Paris which appeared in AUTOMOTIVE INDUSTRIES of April 10, under the caption "Solex Plans to Operate a Plant in the United States." This article declares that "up to the present the Solex company has limited itself to the European market and has never attempted to sell in America, although the Holley company has recognized and pays a royalty on one of its patents."

Specialists Will Study Traffic Relief Abroad

WASHINGTON, April 23—A. B. Fletcher, consulting specialist of the Bureau of Public Roads, has gone to Europe to study highways and highway practices as found in Great Britain and France.

At the present time large sums of money are being spent to provide for the traffic in the vicinity of London by the construction of arterial highways on a scale which has not yet been reached in this country. Similar problems in this country will have to be met in the near future and it is desired that full information be obtained as to what has been done elsewhere.

Both England and France have given a great deal of attention to the prevention of highway accidents in the development of regulations, traffic safety devices and grade crossing elimination. Their experience in these matters, it is expected, will prove valuable in formulating measures to reduce the toll of lives on American highways.

British Protest Cutting Duty Put on German Tires

WASHINGTON, April 23—The British Rubber Tire Manufacturers' Association, Ltd. of London, England, has passed a resolution protesting against the reduction in the Reparations duty on German tires, Assistant Trade Commissioner Park there has advised the Department of Commerce.

"That in view of the severe unemployment already caused in the tire trade by the imports of German covers and tubes at low prices," the resolution states, "this association protests against the reduction in the reparations duty which will further accentuate this competition and cause still greater unemployment among British workers."

Harvard Bureau Getting Data on Jobbers' Costs

CAMBRIDGE, MASS., April 24—The Harvard Bureau of Business Research of Harvard University, which is conducting a survey of costs of doing business in the wholesale automotive equipment field, has received and tabulated up to date statements from 115 jobber members of the Automotive Equipment Association, which is sponsoring the survey.

The bureau hopes to have reports from 200 or more jobbers before it undertakes compilation of a final report.

Firestone Develops Small Bus Balloons

Will Also Be Available for Light Trucks—Star Rubber Announces New Type

AKRON, OHIO, April 23—Although not put into the form of the usual public announcement, information has been given out by the development department of the Firestone Tire & Rubber Co. indicating that one size of balloon tires, the 7.30, can be used on buses carrying not more than ten or twelve passengers and will be available in the very near future for light trucks.

Bus men all over the country have been anxious that the easy riding tire be made available for public conveyances.

During the week the Star Rubber Co. also announced a new balloon tire, in which the cords run with the wheel rather than transversely to the rim. Cords were placed circumferentially in bicycle tires and, therefore, the company does not claim that the idea is entirely new. The new tire is known as the "Loair." The new method of placing cord together with the fact that the tire and its rim are wider than the other balloon tires prevents wobbling and sidesway, according to officials of the company.

The Swinehart Tire & Rubber Co. has produced a new solid tire in two sizes, 30 x 3½ and 32 x 4, on the market. The new tire is known as the "T:N:T". Lateral holes through the body of the tire are staggered and thus absorb a larger number of road shocks, the company states.

Trailer for Farm Use Placed in Production

FOND DU LAC, WIS., April 21—The B. F. & H. L. Sweet Co., a pioneer manufacturer of farm wagons, carriages, etc., and more recently a builder of heavy-duty trailers, has placed in production a new type of trailer de igned particularly for farm use.

The design was worked out in cooperation with the T. W. Meiklejohn Co., Fond du Lac, Wisconsin distributor of the Fordson tractor and tractor implements.

The trailer is so built that it can accommodate a hay-rack, a coal box, a platform body, a milk-can rack, or any of the bodies usually mounted on horse-drawn wagons. The hitch is so made that the tractive power may be either a Ford passenger car, truck or tractor.

MOURRE TO RACE MAY 30

INDIANAPOLIS, April 21 — Antoine Mourre of Paris, France, manufacturer of the Mourre car, has entered the Indianapolis 500-mile race on May 30 and will drive one of his own creations. This will be his first appearance in an American event.

Chicago Laboratory Will Test Used Cars

Dealers Evolve Plan Which It Is Hoped Will Prove of Value in Increasing Sales

CHICAGO, April 21—The Automotive Testing Laboratory, a division of the Chicago Automotive Trade Association, began functioning today. Through the agency of this division the association hopes to facilitate the sale of used cars for its membership.

Two Wasson motor check machines are used in the process of examining a car, in addition to an Ambu electric test and floor inspections, the car being given the most complete system of examination it has been possible thus far to formulate as a means of determining just what shape the car is in.

The association's laboratory is in charge of F. E. Edwards, for years chairman of the Technical Committee of the American Automobile Association, assisted by a coterie of competent helpers. The service is available only to dealers belonging to the association, a fee of $10 a car being charged.

A member may send a car to the laboratory for examination, following which the report as to its condition is turned over to an appraisal committee, to make a valuation before it leaves the laboratory. Then it goes back to the dealer's showroom bearing a sealed tag which indicates that it has gone through the tests of the laboratory.

Members of the association are enthusiastic over the new idea. It is believed by many that the fact that the car bears the label of the laboratory will make it more salable. Other uses for the laboratory have been suggested, but its business for some time at least will be only to serve the association dealers as above indicated.

"We want to give the public honest value," said Thomas J. Hay, originator of the laboratory idea, "and we believe that this is a method to that end."

Elektron Manufacture Is Planned for Shoals

WASHINGTON, April 21—W. W. Atterbury of Philadelphia, vice-president in charge of operations of the Pennsylvania Railroad, in his appearance before the Senate Agricultural Committee in the interest of the Hooker-White-Atterbury offer for Muscle Shoals, said that it was planned by him and his associates to manufacture on the site a new metal, an alloy of magnesium and aluminum, that would revolutionize transportation.

Mr. Atterbury said that his attention was first drawn to this metal while he was in France during the war. He learned of its composition during a discussion with an officer of a captured Zeppelin.

From the above statement it is plain that the alloy referred to is that known in Germany as Elektron. The Elektron processes were covered by patents in the United States, and it is understood that these patents were seized by the alien property custodian, along with all other German patents, and that the Dow Metal Co. was licensed under them. The Dow company has been engaged in the industrial development of magnesium for about a decade. Magnesium is also being produced by other interests in the United States, among them the American Magnesium Corp. of Niagara Falls, a subsidiary of the Aluminum Co. of America.

Australian Duty Ruling Provides for Drawback

WASHINGTON, April 24—The Bureau of Foreign and Domestic Commerce here has made public the following statement following the receipt of a cable from Australia. The ruling covers automobiles, trucks, accessories and tires:

According to Customs Regulation No. 129 made under Section 168 of the Australian Customs Act, a refund or drawback of the full amount of import duties previously paid may be allowed by the Australian customs authorities on all goods exported from Australia either in the original packages or in packages packed in the presence of a customs officer, provided that goods shipped for drawback in other than original packages are exported within three years from the date of importation.

The United States Tariff Act of 1922 provides for the duty free reimportation of returned American goods on proper proof of their identity, if imported by or for the account of the person who originally exported them and without having been enhanced in value or improved in condition by any process of manufacture after having been exported from the United States.

More Tractor Inquiries Received by Hart-Parr

CHARLES CITY, IOWA, April 23—A large increase in business during March is reported at the Hart-Parr tractor factory here, with a number of new orders received in April. The first tractor that the company has shipped to Palestine left the factory recently. A shipment has also gone to Belgium and another to Holland. A gang of men is now busy crating tractors on an order for twenty-four to be shipped to Australia as soon as crated.

The volume of inquiries this spring has been larger than usual, showing the return of buying interest. The greatest interest has been manifested in the States of the Corn Belt, and those of the Northwest and the Southwest. South Dakota leads in volume of inquiries in proportion to advertising done, with Minnesota, Wisconsin, Iowa and Nebraska following in order.

HIGHWAY COURSE AT MICHIGAN

ANN ARBOR, MICH., April 21—Prof. Arthur H. Blanchard announces that the highway engineering and highway transport courses of the summer session of the University of Michigan will begin June 23, lasting to Aug. 15.

Balloon Tire Sales Small Part of Total

Dealers Say There Is No Shortage for Replacements Except in Isolated Cases

NEW YORK, April 23—According to an official of the National Tire Dealers' Association, the results of the latest monthly questionnaire sent to members by that organization shows that the average tire dealer has on hand a stock of about 400 high-pressure tires and more than double this number of tubes.

There has been some apprehension as to ability to move this stock in view of the extensive advertising of balloon tires which now is being carried on, but there is a disposition to believe that, after all, the sale of balloons for the year through retail channels will amount to only a small percentage of the total sales.

Some concerns, however, are advertising that the tires they are marketing can be operated successfully at considerably lower pressures than it was heretofore admitted they could carry and still give reasonable life. The impression given or intended is that the advantages of balloons can be obtained without going to the large section which characterizes the true balloon tire. Pressures as low as 30 lb. are advocated in some cases for such tires.

Interest Shown in Balloons

It is contended that, in spite of the talked of shortage in balloon tires for existing standard 23, 24 and 25 in. rims, there is in fact little if any shortage for replacement purposes, except in isolated instances. While there is much interest in balloon tires, this interest, it is asserted, has not yet gone far beyond the inquiry stage in a large percentage of cases. Sales are being made, but the volume is small as compared with the sale of high-pressure casings. There is said to be practically no demand for casings for 20 and 21 in. rim sizes at retail owing to the expense of new rim and wheel equipment.

Dealers are almost unanimously in favor of eliminating the guarantee on practically all tires sold. Another point on which there is general agreement is in respect to the need for limiting the number of sizes and the number of grades, tread types and colors which complicate merchandising and involve excessive stocks at a time when the business situation is believed to make a minimum inventory desirable.

LAMBERT G. SULLIVAN DEAD

CHICAGO, April 22—A telegram from Albuquerque, N. M., announces the death there of Lambert G. Sullivan, at one time news editor of *Motor Age*. Mr. Sullivan was 35 years of age and a well known sporting writer, having been connected with the Chicago *Daily News* and Chicago *Herald* and *Examiner*.

Men of the Industry and What They Are Doing

Graham to Represent N. A. C. C.

George M. Graham, vice-president of the Chandler Motor Car Co., will represent the National Automobile Chamber of Commerce as a speaker at the twelfth annual meeting of the Chamber of Commerce of the United States, which will be held in Cleveland May 6 to 8. Mr. Graham will talk on "Recent Developments in Highway Transport" Wednesday afternoon, May 7, at the Transportation and Communication session.

Hoffman Becomes Vice-President

R. J. Hoffman, well known in the industry as engineer of the Linde Air Products Co. and later as general operating superintendent of both Linde and Prest-O-Lite companies, has been elected vice-president of the Prest-O-Lite organization. Mr. Hoffman was appointed general superintendent of plants in charge of all Linde and Prest-O-Lite plants in 1916, and in 1918 was made works manager. In 1921 he took charge of the main Prest-O-Lite plant at Indianapolis.

Other changes include the appointment of James Rafferty to succeed Mr. Hoffman as works manager of the Linde and Prest-O-Lite plants, while L. M. Moyer, general sales manager of the Linde-Prest-O-Lite gas organization, becomes vice-president of the Linde Air Products Co.

Adgate Joins G. M. Export Co.

F. N. Adgate, western sales manager of the Lancaster Steel Products Corp., a General Motors subsidiary, is joining the General Motors Export Co. at New York. W. J. Clucas, recently district manager for the Lancaster corporation at Buffalo, succeeds Mr. Adgate of Detroit, with the title of district manager. W. K. Jones takes over Mr. Clucas' territory, with headquarters in Cleveland. Mr. Adgate will travel South America for the General Motors Export Co., which has offices in Buenos Aires and Rio de Janeiro.

Willis Starts on World Tour

George E. Willis, manager of Studebaker export sales, has sailed for England to be gone on a seven months trip around the world. His itinerary includes practically every important market in Europe as well as the Far East and New Zealand.

Hexter Is Selden Sales Director

P. K. Hexter of New York has joined the Selden Truck Corp. as vice-president and sales director. Mr. Hexter is a veteran of the motor truck branch of the automotive industry. He was formerly eastern sales manager for the Republic Motor Truck Co. Later he became vice-president and general sales manager of the Day-Elder Motor Corp., leaving that position in 1918 to go overseas with the Motor Transport Corp. For the last few years he has been acting in an advisory capacity in special sales work. Mr. Hexter succeeds Hal T. Boulden, who was connected with the Selden corporation for nine years and who has left the automobile industry to join the William Elliot Graves, Inc., financial publicity specialists, located at 52 Vanderbilt Avenue, New York.

Mansfield Heads Maxwell in Canada

John D. Mansfield has been elected president and general manager of the Maxwell-Chrysler Motor Co. of Canada, Ltd. Following his resignation from the Dort Motor Car Co. of Flint and the Gray-Dort Motor Car Co., Ltd. of Chatham, Ont., several weeks ago, it was announced that he would represent the Maxwell interests in Canada, but his exact status was not established until this week when the appointment was given out. Mr. Mansfield has established headquarters at the Windsor factory. One of his first official acts was to appoint C. S. Hoben, formerly sales manager for Studebaker in Canada, as special Maxwell-Chrysler representative in the Dominion.

Harry M. Wallis Resigns

Harry M. Wallis, since 1892 president of the J. I. Case Plow Works Co., Racine, Wis., and founder of the Wallis Tractor Co., which was merged with the Case company several years ago, has tendered his resignation.

Columbia Appoints Cline

Benjamin J. Cline has been appointed director of production of the Columbia Motors Co., succeeding T. A. Bollinger, recently resigned. Since 1901, when he entered the industry, Mr. Cline has been identified with Pierce-Arrow, Thomas, American Motors, Chandler and Oakland production.

Allen Will Assist Glass

W. C. Allen has been chosen to serve as assistant to F. E. Glass, sales manager of the Oakes Co. of Indianapolis, maker of spare tire and spare wheel locks. Mr. Allen has been identified with the advertising departments of the Cole Motor Car Co., Apperson Brothers Automobile Co. and King Motor Car Co. and also has been sales manager of the Perfection Windshield Co.

Reeves Opens Offices

Clifton Reeves, for the last five years industrial engineer of the Willys-Overland Co., has opened offices at 149 Broadway, New York City, where he will engage in a general industrial engineering practice. A Detroit office will be maintained in the General Motors Building.

Uniform Theft Laws Urged in All States

Suggestion of U. S. Chamber Committee to Be Considered at Annual Meeting

WASHINGTON, April 23—With automobile thefts in the United States keeping pace with the rapid increase in motor vehicle registration during the last few years, the Insurance Advisory Committee of the Chamber of Commerce of the United States has recommended enactment of automobile title laws by the various States as an important means of decreasing thefts.

The committee recently completed a detailed investigation of the automobile theft situation. Its findings and recommendations are incorporated in a report which will be considered by the membership of the chamber at its annual meeting in Cleveland next month.

The committee's report says:

The chief feature of automobile title laws is that the burden of proof regarding ownership is placed upon the possessor of an automobile. In order to register his car for license, the owner must first obtain a title certificate which will show his right to possess the automobile.

In the event he sells the car, the title is assigned and the new certificate recorded by the State. In this respect there is a decided similarity between such certificate and deeds in real estate. Both the deed and the automobile certificate are evidences of ownership and no legal transfer of property can be made without them.

The value of uniform legislation of this nature in all States is readily apparent. The committee, therefore, urges that these laws be placed upon the statute books of all States. This legislation should be uniform in principle, contain adequate provision for enforcement and penalties for violations.

Marine Act Section 28 Is Effective June 20

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that the railroads might be given a chance to adjust their rates.

The whole idea of Section 28 was to give preferential railroad rates to goods passing through American ports when shipped in American bottoms. The issue has become so involved, however, and the results so dubious that Representative Walter S. Newton, representing Northwestern millers, called on President Coolidge Monday of this week and urged that he conduct an investigation.

The suggestion of Congressman Newton is in line with the provisions of a bill introduced by him, asking that the effective date of the order be postponed one year.

Transport Congress Sessions Arranged

First Will Be Held on May 21, with John N. Willys, Committee Head, Presiding

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gates will concern automotive problems confronting countries in South, Central and North America, and Means for Solution.

Service Session

F. A. Bonham, chairman of the N. A. C. C. Service Committee, presiding at joint meeting of delegates to World Motor Transport Congress with delegates to the National Automotive Service Convention.

2 p. m.—"Selling Service," illustrated with slides by Carl H. Page, director of sales of Durant Motors of New Jersey.

2.45 p. m.—"Simple Accounting System for the Service Station," illustrated with slides by William G. Eiben, vice-president of the Comfort Printing Specialty Co.

3.30 p. m.—"The Automotive Electrical System Explained," illustrated with slides by Warren K. Lee of the North East Electric Co.

Visit to Automotive Maintenance Equipment Show

6 p. m.—Delegates to the Congress will be given an opportunity by invitation especially extended, to observe most modern equipment used in automotive service stations. Exhibition remains open to delegates until 10 p. m.

FRIDAY, May 23

Automotive Finance Session

10.15 a. m.—"Financing of Automobile Dealers in Carrying Stocks," A. R. Erskine, chairman of the Studebaker Corp.

10.45 a. m.—"Can Wholesale Financing Plans Be Internationalized?" Discussion led by Lawrence B. Ross, representative of the Havana Chamber of Commerce, Cuba.

11.15 a. m.—"Methods of Financing Retail Sales of Motor Vehicles" C. C. Cooper, president, G. M. Acceptance Corp.

11.45 a. m.—"Can Facilities for Retail Automotive Financing Be Expanded Internationally?" Discussion led by Adolphe Saurer, representative of Chambre Syndicale Suisse, de l'Industrie de l'Automobile, du Cycle et Parties qui s'y rattachent.

Luncheon in Honor of Delegates from Near East and Africa

12.30 a. m.—Informal discussion will concern automotive problems and means for solution thereof in various countries of the Near East and Africa. Inspection Tour of Highway Construction.

2.30 p. m.—Delegates will have an opportunity to inspect and receive expert advice on different types of road construction and maintenance in environs of Detroit.

Highways Session

8 p. m.—"General Economics Underlying the Highway," Thomas H. MacDonald chief of the U. S. Bureau of Public Roads, Washington.

8.30 p. m.—"Financing of Roads," A. J. Brosseau, president of Mack Brothers Motor Car Co.

9 p. m.—"Relation of Highways to Other Means of Transportation," Roy D. Chapin, chairman of N. A. C. C. Highways Committee and of the Hudson Motor Car Co.

9.30 p. m.—"How Can Obstacles to Extension of World's Highways Be Overcome?" Discussion led by F. O. Goode, representative of the American Chamber of Commerce for Brazil.

SATURDAY, MAY 24

Government Session

10.15 a. m.—"National Economics of Motor Transport," J. Walter Drake, assistant secretary of the U. S. Dept. of Commerce.

10.45 a. m.—"How Can International Trade in Motor Vehicles Be Facilitated?" Discussion led by Ludwig Buchkremer, president of Deutscher Automobil-Haendler Verband, Germany.

11.15 a. m.—"Outstanding Developments in Automotive Legislation," H. H. Rice, chairman of the N. A. C. C. Legislative Committee and president of the Cadillac Motor Car Co.

11.45 a. m.—"What is an Equitable Basis for Motor Taxation and Legislation?" Discussion led by C. G. Saker, representative of the South African Motor Traders Association.

Luncheon in Honor of Delegates from Europe

12.30 a. m.—Informal discussion will concern automotive problems and means for solution thereof in various countries of Europe.

Session on Association Activities

2.30 p. m.—"The Association of Motor Vehicle Owners as an Agent of Progress" Thomas P. Henry, president of the American Automobile Association, Washington.

3 p. m.—"Economic Functions of the Automobile Dealers Association," speaker to be announced later.

3.30 p. m.—"The Automotive Manufacturers' Associations as Links of Cooperative Helpfulness" Alfred Reeves, general manager of the N. A. C. C.

Banquet

John N. Willys presiding.

8 p. m.—Formal banquet in honor of all delegates to the Congress.

9 p. m.—"Motor Transport a New Artery of World Trade," speaker to be announced later.

British Price Changes May Come at Same Time

LONDON, April 14 (*by mail*)—A movement is afoot within the industry with a view to inducing passenger car makers to announce their programs and prices each year at or about the same time, the middle of August being suggested as the most favorable period.

Simultaneous price announcements, it is held, would assist in eliminating the dead season hitherto existent between the end of July and the opening of the Olympia Show, by removing an element of doubt from the minds of prospective buyers in late summer and early autumn and giving them assurance that no financial or other advantage would accrue by delaying purchase or the placing of orders until the show.

The setting forward of the show date by a fortnight this year has that object, but it is considered by many dealers that simultaneous and early announcements would be even more effective in leveling up the seasonal demands.

Export Paper Issued for English Readers

First Number of "American Automobile" (Overseas Edition) Comes from Press

NEW YORK, April 22—The first number of the *American Automobile* (Overseas Edition), a monthly, is off the press. It is published by the Class Journal Company in conjunction with *El Automovil Americano*, the specialized export paper in Spanish which for seven years the Class Journal Company has produced for the automotive trade in the Spanish and Portuguese-speaking territories of America, Europe, Africa and other sections. The same staff will serve both publications, with George E. Quisenberry in the editorial chair.

The new magazine is printed in English and its field is world-wide, serving the industry in all sections of the world in which English is the common language or is understood commercially. Like its Spanish mate, it is designed to meet the needs of American manufacturers seeking export business and its editorial contents are planned with this end in view.

In the May issue, the first, the editorial section covers everything of interest to the export trade, its table of contents including the following:

Automotive Industry Attains World Import and Development.
Lift Ignition Options on Left Drive Cars.
World Registration Totals 18,241,477 Cars and Trucks.
World Census of Cars and Trucks.
Detailed Refinements Feature 1924 Engines, Chassis and Fittings.
Greater Profits and Sales.
Charting the Course of the Industry.
Trading Used Cars to Build Larger Volume of Sales.
Motor Car and Improved Highway Active Influence of Progress.
The Achievement of High Quality and Quantity Production.
Production of Balloon Tires Expands as Use Enlarges.
Equipment and Layout of the General Service Station.
Automotive Shipments During January and February, 1924.
Accessories.
Garage Equipment.
Price Changes Affect Important Lines.
News of the World.
Automotive Specifications.

Among the contributing writers in this issue are John N. Willys, president of the Willys-Overland Co.; Neal G. Adair, editor of *Motor World;* P. M. Heldt, engineering editor of *Automotive Industries;* W. L. Carver, field editor of the Class Journal Co.; Hebert Chase of the engineering staff of *Automotive Industries* and B. M. Ikert, technical editor of *Motor Age.*

VICTOR BALLOON OUTPUT

SPRINGFIELD, OHIO, April 22—Production of balloon tires has been doubled recently at the plant of the Victor Rubber Co.

Sales Swing Upward in Midwest States

Both Illinois and Indiana Report Marked Gain in March Over Preceding Month

CHICAGO, April 23—With the approach of spring and the touring season, sales of new passenger cars in Illinois and Indiana moved sharply upward during March as compared with the preceding month. The increase in Illinois was 47 per cent and in Indiana a gain of 45 per cent was registered. The largest increase in either State was shown by Ford sales in Illinois which bettered February's mark by 81 per cent. High priced cars did well in Indiana with a gain of 77 per cent.

Changes in the various price classes are indicated by the following table:

ILLINOIS

	Gain, Per Cent
Fords	81
Low (excluding Fords)	33
Medium	26
High	21
Total sales	47

INDIANA

	Gain, Per Cent
Fords	40
Low (excluding Fords)	51
Medium	54
High priced	77
Total sales	45

Following are the detailed registration figures:

ILLINOIS

Month	Fords	Low Excl. Fords	Med. Price	High Price
January	4,101	2,187	5,871	1,013
February	3,201	1,724	3,762	567
March	5,798	2,396	4,761	690
Total	13,100	6,307	14,394	2,270

INDIANA

Month	Fords	Low Excl. Fords	Med. Price	High Price
January	4,106	1,007	1,259	104
February	4,748	1,353	1,743	121
March	6,664	2,054	2,688	215
Total	15,518	4,414	5,690	440

Illinois statistics were compiled from data furnished by Robinson's Advertising Service, Springfield, Ill. Figures for the Indiana statistics were supplied by the Indianapolis Automobile Trade Association, Indianapolis.

Indiana Figures for Quarter

INDIANAPOLIS, April 23—New car sales based on registration figures show that Indiana for the first quarter of 1924 sold 580 more passenger cars than in the corresponding period of last year, a gain of slightly more than 2 per cent. March figures of 11,621 new cars sold as against 13,594 in March of 1923 represents a loss of about 12 per cent.

This percentage is not an absolutely

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INVENTS BILLBOARD LANDING FOR PLANES

NEW YORK, April 21—An invention by Lt. Col. Harold E. Hartney of Washington and New York is expected to be of great value for commercial night flying in that it provides a cheap and effective means for planes to land. It is a billboard landing device set up in accordance with the general terrain, sometimes replacing a portion of the fence and again lying at right angles to it.

Pilots passing by day or night can tell at a glance just how they should approach that particular field to insure the best landing and are guided to earth by an indirect system of lighting. It costs comparatively nothing to erect and maintain because it is an advertising billboard for day and night use.

932,548 Registrations Reported in California

SAN FRANCISCO, April 23 — Comparative figures just made public by the division of motor vehicles of California indicate that this State will have 32.5 per cent more automobiles and motor trucks at the end of 1924 than were registered in 1923.

The estimates of the division are based on a comparison of automotive licenses renewed during January and February of this year, showing a total of 932,548 automobiles and trucks registered during that period, as compared with 629,742 registrations during the same period of 1923. These registrations compare as follows:

Class of License	1923 (Jan. and Feb.)	1924 (Jan. and Feb.)
Passenger cars	605,954	826,671
Pneumatic trucks*	.....	77,927
Solid trucks	23,188	27,950
Motorcycles	6,694	6,582
Trailers	1,803	4,088
Transfers	19,730	70,546
Chauffeurs' licenses	36,774	49,527

*Pneumatic trucks were registered as passenger cars until 1924.

New Overland Factory to Be Formally Opened

PHILADELPHIA, April 22—Tomorrow the big plant of the Willys-Overland Atlantic Co. will be formally opened. Arrangements have been completed for a celebration that will properly commemorate the occasion.

Willys-Overland dealers from all sections of the territory served by the new plant will attend and John N. Willys and Roy Peed, general salesmanager, with other prominent officials from Toledo, Ohio, will be present.

For several weeks the plant has been producing cars.

Buses Do Not Share Tax Load, Says Bank

Trolley Companies Carry Burden, It Declares—Statistics Disprove Statements

NEW YORK, April 22—A statement made by the National City Co. in its booklet, "Mighty Servants of Civilization," in which it takes up the cudgel in behalf of the traction companies, to the effect that motor buses have not shared the tax burden with the trolley companies and that the expense of maintaining the highways and similar costs have been saddled upon the already heavily burdened taxpayer," is disputed by statistics compiled by the automobile industry.

As proof that the motor vehicle pays its share, these statistics show that last year $188,947,000 was collected from motorists for State registrations, of which $153,203,506 was applicable for road maintenance. This is only a small share of what it cost the motorists of the country in the way of taxes, collections from all sources totaling more than $450,000,000.

The booklet says:

The electric railway industry enjoyed prosperity practically from its inception to the time of the entrance of this country into the World War. Notwithstanding continuing good traffic, the rising costs beginning at that time, together with the inflexibility of the rates of fare fixed in many instances by old municipal franchises, produced a heavy financial strain which some companies were unable to withstand. And added to this severe handicap, unfair bus competition was allowed in many instances.

The effects of the low fixed rates of fare, the jitney competition and the abnormally high operating costs were for a time serious in many cases and there still remain some unfavorable conditions to overcome. On the whole, however, the traction situation may be said to have definitely turned the corner toward renewed prosperity.

Business in Charlotte Better; Good Year Seen

CHARLOTTE, N. C., April 23—Spring business in the passenger car field, which has been slow in getting under way here on account of the late spring, is picking up rapidly, and dealers look for a good year.

The North Carolina Good Roads System is proving a big factor in building sales throughout most of the territory of which this is the distributing center. Both the business and industrial conditions are excellent in the automotive field. The McLaren Rubber Co. is running at near capacity on tire production, and work is being pushed rapidly on the erection of the big Ford assembly plant.

Reports from States to the north, south and east indicate that spring business has been held back by weather conditions, but is now getting into full swing. Business in accessories, replacement parts and shop equipment is reported excellent by jobbers.

Paris Bus Interests May Use Pneumatics

Road Upkeep Important Factor in Experiments Completed with That Type of Tire

PARIS, April 15 (*by mail*)—Experiments with pneumatic tires on Paris motor buses, in service between June 26, 1922, and Feb. 12, 1924, show that 19,065 miles can be got on one set of tires. During the time it was in service, the 38-passenger single deck bus, which had been converted from solids, used up three sets of pneumatic tires of 1085 by 185 size (duals on the rear wheels).

The first set ran 12,661 miles without a puncture and were taken off at this distance at the request of the Michelin company, who wished to examine their condition. The second set covered a distance of 16,602 miles, and the third set 19,065 miles.

26,500 Miles for Solids

With solid rubber tires the average distance covered is 22,000 miles on the front wheels and 31,000 miles on the rear wheels, giving an average of 26,500 miles for the set, the cost working out at 0.059 francs per kilometer. As the pneumatic tired bus has detachable wheels, the rear tires are passed to the front and vice versa, thus equalizing the mileage, the best results being 19,065 miles on one set, giving a cost per kilometer of 0.105 francs.

These results were obtained with a bus chassis designed for solids and consequently of heavy construction. Probably some improvements could have been obtained had the bus been designed in the first place for pneumatics.

While the mileage cost of pneumatics is nearly twice as much as solids, it is claimed that economy in maintenance and in road upkeep more than offsets this. Last year the solid-tired Paris buses were brought in for a complete overhaul on an average at the end of 37,996 miles, after which distance both engine and chassis need attention. This overhaul costs about 8000 francs, giving a cost of 0.13 francs per kilometer for general overhaul, independently of daily maintenance, which probably equals this amount.

Chassis in Better Condition

After 48,329 miles on pneumatics, the bus engine needed attention, but it was found that the chassis was in very much better condition than those running on solid rubber tires. This indicates that if pneumatics were used the bus could be brought in for tightening the main and connecting rod bearings after about 35,000 miles and only completely overhauled after 75,000 miles running, thus reducing the maintenance cost from 0.13 to 0.066 francs per kilometer, and making the use of pneumatics as cheap as solids.

These results are so encouraging that the Paris Municipal Council, which runs the city bus service through a controlled company, is considering the advisability of abandoning the use of solid tires for its fleet of 1200 buses.

One of the arguments in favor of this move is that pneumatics will reduce street maintenance costs, although it is obviously difficult to get really accurate figures on this point. In considering how much the buses cost to operate, the Paris Municipality is of the opinion that it should not disassociate road maintenance from vehicle maintenance.

Los Angeles Has Plan to Revive Road Racing

LOS ANGELES, April 23—An attempt will be made to revive road racing here if plans of the promoters, as announced, are fulfilled. The contest will be a radical innovation, inasmuch as the route to be covered will be over privately owned property. The State law prohibits speed contests of any kind on public highways. George Bentel, owner of the Ascot Park dirt track, is sponsoring the project.

The proposed course has been surveyed and announcement has been made that the first race will be Thanksgiving Day for a prize of $50,000. The course to be constructed will be 30 ft. wide and about 4½ miles long. More than half of the entire course will be in full view of spectators in the grandstand. The contemplated road is to have a number of extremely sharp, hairpin turns and one grade of nearly 30 per cent.

Mr. Bentel expects automobile factory engineers to become interested in the proposition. He declares that racing over such a course will provide experience of value to automobile builders. The claim is made that on the board track speedways of the country, top speed is the only thing sought after and, as a consequence, the building of cars capable of participating is restricted to only two or three concerns in this country.

Turin Will Stage Show from May 31 to June 15

WASHINGTON, April 24—Decision has been reached in Turin, Italy, to hold an automobile show there, beginning May 31 and continuing until June 15, according to advices received here by the Department of Commerce. Printed plans and prospectuses are expected to be published in a short time.

Point is made in the dispatch that the holding of an automobile show in Turin, where 90 per cent of the country's automotive productive capacity is centered, is not entirely a new venture, as some years before the war a show was held from time to time in Turin, but the prominent place for such a display was finally taken by the Milan Sample Fair.

"However," the advices conclude, "various business interests in Turin think that the position of their city in Italian automotive trade has been slighted by neglect to hold an exhibition there, and they have at last carried their point."

Factories Paid Visit by Railway Officials

Follows Conference on Traffic Held with Freight Managers of the N. A. C. C.

DETROIT, April 22—A conference with the Loading Rules Committee of the American Railway Association preceded the monthly meeting of freight traffic managers of the National Automobile Chamber of Commerce held here last week. The committee consists of R. L. Kline and F. H. Blake of the Pennsylvania Railroad, R. G. Dyer of the Norfolk & Western; Ira Everett of the Lehigh Valley; G. H. Lo ejoy of the Detroit Terminal and V. R. Hawthorne representing the association.

After discussing the railroad specifications which govern the blocking, bracing and double decking used in freight cars for automobile shipping, the railway officials were taken to several of the Detroit plants to obtain first-hand knowledge of how the factories handle this feature.

They were highly interested in the rapidity and completeness with which double decking of cars is accomplished, also boxing and handling for export wherein an automobile is placed compactly in a box, marked and loaded on a car for a foreign country within half an hour.

Tells of Hearing on Section 28

At the traffic managers' meeting, E. N. Hodges of the Hupp Motor Car Corp., chairman of the special committee appointed to look into Section 28 of the Merchant Marine Act, reported the appearance of this committee before the House Committee on Merchant Marine at Washington. It was found that the effect of this section might make shipping conditions more favorable from Canadian plants and the committee joined with all other exporters in urging postponement of its enactment until July 1, 1925. In the meantime it is expected that certain practical difficulties may be removed by legislation.

Companies represented at the managers' meeting were as follows:

Buick, Cadillac, Chevrolet, Chandler, Dodge Brothers, Durant, Flint, General Motors Truck, Haynes, Hupp, Lincoln, Maxwell, Oakland, Olds, Paige-Detroit, Pierce-Arrow, Reo, Studebaker, White, A. O. Smith Corp., and the Edward J. Budd Manufacturing Co.

There were also representatives present from the Motor and Accessory Manufacturers Association.

KLAXON SHIPMENTS INCREASE

NEWARK, N. J., April 21—The Klaxon Co. reports that during the months of January, February and March of this year it shipped 128,000 more horns than during the corresponding quarter of 1923, an increase of 50 per cent for that period.

U. S. Rubber Perfects Means to Ship Latex

Its Monthly Shipments Are Reported to Reach High Figure of 250,000 Gallons

NEW YORK, April 24—Difficulties at first encountered in bringing into this country rubber in liquid form have been overcome, the United States Rubber Co. announces, and at the present time the shipments to this country of this latex are reported to run as high as a quarter of a million gallons monthly.

As the chief shipper of liquid rubber, the company states that practically the entire production of its plantations in Sumatra and the Malay Peninsula is imported as latex or in the form of sprayed rubber, which is rubber coagulated in the manner its name implies by a new mechanical process.

The United States Rubber Co. has established a "process" department which takes over the latex from the plantations and manufactures it into sprayed rubber at its eastern spray plants or ships to America in latex form.

To handle this latex it has required the adoption of revolutionary measures. If shipped in liquid form to America, it is first stored in big reservoirs at the seaboard, the chief ports of shipment being Belawan, Sumatra and Port Swettenham in the Federated Malay States.

The steamship lines bring the liquid rubber over in the ballast and oil tanks as cargo, and upon arrival at an American port the latex is pumped by the company's own equipment into railroad tank cars, which are carried alongside the ship by a barge, following which the tank cars transport the latex by rail to the various factories where latex is used.

Stops Bus Competition with Ohio Interurbans

COLUMBUS, OHIO, April 22—The Public Utilities Commission of a State has full power to withhold certificates of convenience and necessity to bus lines where adequate service already is offered by interurban railways, according to a decision handed down by the Ohio Supreme Court.

This decision was rendered following an attack by bus operators on the commission's ruling, the bus operators claiming that this created a monopoly and that the commission exceeded its authority in refusing them certificates, merely because their operation threatened interurban lines which were already giving adequate service and were prepared to handle increased traffic.

FINAL REPORT ON OLD ELGIN

CHICAGO, April 23—The final report of the receiver of the Elgin Motor Car Corp., whose assets were purchased by Elgin Motors, Inc., has been filed in the United States District Court. It indicates that $79,655 will be available for creditors. More than $136,000 has been collected by the receiver, but a claim for $5,000 taxes by the Collector of Internal Revenue will have to be adjusted before the distribution of assets.

FINANCIAL NOTES

Hayes Wheel Co. earnings for the first quarter, including the earnings of those companies which were acquired as of April 1, amounted, after taxes, to $510,000, or at the annual rate of approximately $9.50 a share on the common. Gross sales, not including the sales of the recently acquired companies, amounted to $5,664,759, against $4,533,424 for the same period last year.

Hupp Motor Car Co. reports for the quarter just ended net profit of $392,121, after Federal taxes. This is equivalent after preferred dividends to 42 cents a share (par $10) earned on $9,138,000 outstanding common stock. The consolidated balance sheet shows $1,703,578 in accounts receivable, $12,077,046 cash and $9,278,067 in inventories.

Chicago Motor Coach Co. reports operating earnings of $2,204,791 for 1923, against $963,161. Net earnings after all charges, including reserves for taxes, totaled $280,882, against $128,539. After preferred dividends there was a balance of $140,882 for the 50,000 common shares of $5 par value common stock, or equivalent to $2.81 a share.

Canadian Consolidated Rubber Co., Ltd., a Canadian concern of which C. B. Seger is chairman, reports that for 1923 it turned a deficit of $781,876 in 1922, into a surplus of $696,044, equal to 24.8 per cent earned on the common capital. Sales totaled $14,590,434, against $13,221,575, a gain of over 10 per cent.

Stewart-Warner Speedometer Corp. has declared the regular quarterly dividend of $2.50, payable May 15 to stock of record April 30. Net earnings of $1,496,700 for the quarter are reported, or $3.15 a share, compared with $1,827,974 or $3.84 a share a year ago.

Mengel Co. directors have declared a dividend of 8¾ per cent on the preferred stock payable May 1 to stockholders of record April 30. On March 1 the company paid a dividend of 3½ per cent on the preferred.

Goodyear Tire & Rubber Co. earnings for the first quarter indicate that there will be approximately $12,000,000 available for charges in 1924, according to Clarence Dillon of Dillon, Read & Co.

Doehler Die Casting Co. reports earnings of $255,348 for the first quarter, equivalent to $1.43 a share. Sales for the quarter were $2,001,673, compared with $1,722,357 last year.

Pyrene Manufacturing Co. has declared the regular quarterly dividend of 25 cents a share on the common stock, payable May 1 to stock of record April 21.

Reynolds Spring Co. has declared its regular quarterly dividend of 1¾ per cent on A and B preferred stock, payable July 1 to stock of record June 16.

Gray & Davis Co. reports net earnings for the first quarter of $46,481, equivalent to 33 cents a share on the 134,182 shares of common stock outstanding.

Hudson Motor Car Co. reports net income of $1,301,363, after depreciation, etc., for the first quarter, in comparison with $1,689,268 a year ago.

Wright Aeronautical Corp. has declared the regular quarterly dividend of 25 cents, payable May 31 to stock of record May 15.

BANK CREDITS

Written exclusively for* AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.

Conflicting tendencies are still apparent in trade and industry. Last week's improvement in some branches of wholesale and retail trade was offset by further reports of curtailment in certain basic lines. General commodity prices continued to decline.

The total freight traffic originated by American railroads in 1923 was 1,277,318,731 tons, the largest figure ever recorded. It compares with 1,023,745,000 tons in 1922 and 930,182,560 tons in 1921. Another record was broken in February, when Class I railroads handled 35,962,421,000 net ton miles of traffic, 10.2 per cent in excess of the total a year ago.

A revised estimate by the Department of Agriculture places the total value of farm products in 1923 at $12,204,000,000, as against $11,244,000,000 in 1922 and $9,922,000,000 in 1921. Not only were the totals of both crops and livestock greater than in the preceding two years, but the former was greater than in any year prior to 1917, and the latter greater than in any year prior to 1918.

Decline in Crude Petroleum

The production of crude petroleum in the week ended April 12 averaged 1,953,350 barrels a day, comparing with a daily average of 1,915,000 in the preceding week and 1,951,650 in the corresponding period last year. The greatest increases were in Arkansas and Wyoming and Montana. The only decrease was in Central Texas.

Fisher's index stood at 145.6 last week, resuming the long decline which was interrupted in the preceding week, when the index rose from 146.2 to 146.6.

Discounts by Federal Reserve banks declined $60,000,000 during the week ended April 16, bills secured by Government obligations accounting for $37,900,000 of the decrease. Bills bought in the open market declined $20,900,000, Government securities $2,200,000, and Federal Reserve notes in circulation $15,300,000. Total deposits decreased $43,500,000, a loss of $49,100,000 in Government deposits being partly offset by small increases in other deposits. Reserves increased $3,900,000, and the reserve ratio rose from 79.3 to 80.6 per cent.

Falling Off in Loans

Loans of reporting member banks declined $46,000,000 during the week ended April 9, a decline of $57,000,000 in loans secured by stocks and bonds being slightly offset by increases in other classes of loans. Investments declined $15,000,000, and net demand deposits $82,000,000, while time deposits increased $11,000,000, and borrowings from Federal Reserve banks $6,000,000.

Interest rates continued easy last week, call money ranging from 4 to 4½ per cent, with the lower rate as the ruling quotation. Time money moved in very small volume at 4½ to 4¾ per cent.

Rubber Restriction Not Raising Prices

Steady Decline in Crude Market Shown Since Stevenson Act Became Effective

AKRON, April 23—Information reaching here from Washington indicates that the campaign to "Raise Rubber Under the American Flag" or at least in other than British and Dutch territory, is bearing fruit, but at the same time the crude rubber market indicates that the fears entertained regarding the ability of the British restriction act to increase prices were not well founded.

An average price of crude during one week this month was close to 22 cents a pound, while the same quality of rubber during an average week of the same month last year was about 32 cents a pound.

Instead of increasing the price to above 50 cents a pound and to make possible the payment of the British debt to America by means of the rubber restriction the year that the act has been in operation has witnessed a steady decline in the market.

Information from Washington indicates that the first formal reports from the surveying parties which have gone into most of the regions where it is believed rubber can be grown will be given out within the next two months. The same authorities state that it is not unlikely that the Amazon Valley will prove to be one of the places to be recommended as one of the logical places for the growing of rubber in this hemisphere.

The production of crude rubber from wild trees in this basis was halted a decade ago when the Brazilian government placed taxes upon the production of crude rubber not unlike that restriction placed upon its exportation by the British colonial government.

The survey will prove important from the viewpoint of the future, however, in the opinion of those manufacturers who were most ardent in advocating it.

Railway Buys Bus Line in Rochester as Feeder

ROCHESTER, N. Y., April 23—The New York State Railways has purchased the majority stock of the East Avenue Bus Co., operating a fleet of buses between here and the suburb of Pittsford.

No changes will result at the present time in either service or equipment. The purchase is believed part of the railway company's policy to inaugurate and control gasoline bus line feeders for its street car system.

34 CITIES USE APPLEBY PLAN

DETROIT, April 23—Percy Chamberlain Associates, Inc., has issued a bulletin in which it sets forth that since late in October, 1923, forty-two cities have opened public motomarts under the Appleby used car plan. After five months of operation thirty-four cities are actively engaged in selling under the plan and eight cities have discontinued upon suggestion of the dealers or Chamberlain Associates.

INDUSTRIAL NOTES

Davis, Kraus & Miller, Inc., of Detroit, has been organized by Clem H. Davis, Lowell R. Kraus and Hugo Miller, associated for many years with H. Scherer & Co., to succeed to the commercial business of the Scherer company, maker of automobile trimmings. The new concern intends to carry on the business in the same location, 440 Jefferson Avenue, East.

Standard Plate Glass Corp. has purchased the Watson Paint & Glass Co. of Pittsburgh, the price being said to be in excess of $1,000,000. It is stated that the Watson factories will be enlarged, while the warehouses of both companies will be used to distribute the products of both. The Watson company has been earning at the rate of about $200,000 a year.

J. W. Murray Manufacturing Co., maker of automobile accessories, has purchased 15 acres of land adjoining the Western Pacific right-of-way in Oakland, Cal. The consideration is not announced. This will be the fifth factory of the Murray company in the United States, and plans for the plant are now under way in the home offices in Detroit.

New Sytem Followed in Tire Construction

WASHINGTON, April 24—A great forward step in tire construction is claimed by Messrs. W. and A. Bates, Ltd., St. Mary's Mills, Leicester, in their new cycle and cycle-car tire made with weftless cord, it is announced here by the Rubber Division of the United States Department of Commerce. Describing the tire, the announcement says:

The great advantage is that every strand is separately coated with rubber before being made into sheet forms, thereby securing 50 per cent greater adhesion between the cords, and at the same time arresting the friction set up by the weft in the ordinary cord fabric.

This tire has thoroughly satisfied its manufacturers in extensive tests on the road and on the track, and they express the opinion that in time all cord tires will be manufactured by this system.

Daum Named to Manage Pennsylvania Rubber

JEANNETTE, PA., April 24—George W. Daum has been elected vice-president and general manager of the Pennsylvania Rubber Co. to fill the vacancy caused by the death of Seneca G. Lewis.

Mr. Daum has been with the company since 1909, coming from the B. F. Goodrich Co. He has held successive positions of cost manager, assistant superintendent, superintendent, production manager and vice-president-assistant general manager.

METAL MARKETS

Sugared phrases about sentiment in the steel market continuing excellent fail as a cure for sagging demand and sagging prices. There appears to be only one sane interpretation of prevailing conditions. With the capacity which war demand and several post-war booms have added to the steel industry, it is in a position to care for the peak demand without strain, and whenever there is a marked decline under peak demand, the potentially much greater supply weighs heavily on the market. Steel consumption under normal conditions is bound to increase from year to year in proportion to the increase in population and national wealth.

It would seem, however, that just now one of those inevitable periods had been reached in which the extension of capacity had preceded the actual need for it, except for the brief periods of out-of-the-ordinary demand. Statistics, unless properly interpreted, are more apt to confuse than to enlighten. Statisticians place the present activity of the steel industry at the rate of 45,000,000 tons a year, while early in March they gave the rate as 50,000,000 tons. This computation is based on the largely theoretical steel ingot production and would show a mere decline of 10 per cent when, in fact, many mills have a hard time to make orders on their books go far enough to maintain a rate of operations two-thirds that of six or seven weeks ago.

Others more fortunately situated are working at about 75 per cent of their rate of full output. The point completely overlooked by the statisticians, however, is that during the current year's first quarter the steel industry brought its increased equipment and, what is equally important, its efficiency methods to so high a state of productivity that entirely new records for output were scored. For production over the whole year, 1920 still holds the record, but the 9,000,000 tons of plates and sheets rolled in that memorable year strained capacity to the utmost, whereas the rate at which rolling mills poured forth sheets earlier this year furnished proof positive that a duplication of the 1920 demand would find them well prepared to meet it with comparative ease.

The point is that many market observers when they read that the steel industry is today working at 75 or 80 or 90 per cent of capacity think of conditions in 1915 or some of the lean years still more remote when capacity was much more limited than it is now. Moreover one senses that aside from enlarged and improved mechanical equipment the steel industry of late has greatly enhanced mass-for-man productivity of its skilled as well as unskilled labor. It is, therefore, by contrast with the ready absorption of impressively large steel production over an average number of years that the present reaction deserves notice.

Pig Iron—Even single car sales to automotive foundries are few and far between. Prices are nominal in the absence of sales in representative tonnages.

Aluminum—Fresh demand for deliveries during the second half of the year is in abeyance, and the entire market seems to be marking time. Norwegiaan steamships continue to bring in sizable tonnages of metal. Scrap and remelted metal prices are slipping.

Copper—Automotive demand for copper and brass products is light. The copper market continues easy.

Zinc—Quiet and easy.

Calendar

SHOWS

Jan. 3-10—New York, National Automobile Show, under the auspices of the National Automobile Chamber of Commerce, Bronx Armory.

Jan. 24-31—Chicago, National Automobile Show, under the auspices of the National Automobile Chamber of Commerce, Coliseum and First Regiment Armory.

FOREIGN SHOWS

May 10-20—Madrid, Annual Automobile Show, under the auspices of the National Association of Automobile Importers, Palacio del Helo y del Automovil.

May 23-June 1—Oporto, Portugal, Automobile and Aviation Exposition, Exposition Offices, 108 rua de Santa Catarina, Oporto.

May 31-June 15—Turin, Italy, Automobile Show.

Aug. 23-Sept. 6—Toronto, Ont., National Automobile Show in conjunction with the Canadian National Exhibition under the sanction of the Canadian Automotive Equipment Association and the Automotive Industries of Canada.

Oct. 2-12—Paris, passenger cars, motor cycles, bicycles and accessories, Grand Palais.

Oct. 17-25—London, Annual Passenger Car Show, Olympia.

Oct. 22-31—Paris, motor trucks, stationary engines, garage tools and machine tools, Grand Palais.

RACES

April 27—Trapani, Italy, International Automobile Race.

May 30—Indianapolis.

June 14—Altoona.

July 4—Kansas City.

Aug. 3—Lyons, France, European Grand Prix.

Sept. 1—Altoona.

Sept. 1—Syracuse.

Oct. 4—Fresno.

Oct. 19—Kansas City.

Nov. 24—Los Angeles.

CONVENTIONS

April 28-30—Buffalo, Eighth Annual Meeting of the American Gear Manufacturers Association, Lafayette Hotel.

May 5-7—Cleveland, Annual Convention of the United States Chamber of Commerce.

May 6-9—Detroit, Retail Delivery, Association (Fleet Owner Convention.)

May 19-22—Detroit, National Automotive Service Convention and Maintenance Equipment Show, under the auspices of the Service Division of the National Automobile Chamber of Commerce, General Motors Building.

May 19-23—Atlantic City, National Electric Light Association.

May 21-24—Detroit, International Motor Transport Congress under the auspices of the National Automobile Chamber of Commerce.

May 26-29—Cleveland, American Society of Mechanical Engineers.

June 3-4—Detroit, Midsummer Meeting of the Automobile Body Builders Association, Hotel Statler.

June 4-6—Boston, National Foreign Trade Convention.

June 23-25—Atlantic City, American Society for Testing Materials.

June 23-25—National Team and Motor Truck Owners Association.

June—Washington, D. C., American Highway Congress, under the auspices of the Pan American Highway Mission.

Sept. 7—Monza Track, near Milan, Italy, Italian Grand Prix.

Sept. 22-26—Boston, Sixth Convention and International Steel Exposition of the American Society for Steel Treating.

S. A. E. MEETINGS

May 1—Detroit Section, Fabric Bodies, K. L. Childs, Fabric Body Co., Window Lifters, S. W. Nicholson, Dura Co.

May 2—Washington, Traffic and Traffic Accidents.

May 7—Milwaukee Section, Fuels, Thomas Midgley, Jr.

May 9—Midwest Section, Fuels, Thomas Midgley, Jr., All Day Session.

May 13—Pennsylvania Section, Motor Bus Design and Operation, A. E. Hutt.

May 15—Detroit Section, How the Engineer Can Help Solve the Service Problem, H. N. Davock, Packard; O. W. Hunt, Chevrolet; W. T. Fishleigh, Ford.

May 15—Metropolitan Section, Repainting, Dr. A. H. Sabin, National Lead Co.; L. V. Pulsifer, Valentine Co., and E. M. Flaherty and E. H. Briggs, Duco.

June 24-27—Summer Meeting of the S. A. E., Spring Lake, N. J.

Oct. 21-24—S. A. E. Production Meeting, Detroit.

Nov. 18-19—Joint Service Meeting of the S. A. E. with the N. A. C. C. Cleveland.

—Aeronautical Meeting at Dayton at the time of the Pulitzer Races.

January—S. A. E. Annual Meeting, Detroit.

Sales Moving Upward in Midwest States

(*Continued from page* 948)

accurate record of actual car sales and deliveries for March as the chief of the registration bureau of the State motor vehicle department states that an unusually large number of February sales were not registered until March because of a legal mix-up in the registration law and permission given by the registration department for delay.

In some lines the April business is increasing appreciably. As April here last year was just a shade over March of the same year the apparent gain being made in April sales will possibly keep this year's first four months nearly up to last year's mark.

Indianapolis and Marion County show a loss of about 26 per cent for March sales as against last year, but the State records were much better than many distributors had predicted. The total new car sales for the State for the first three months is 26,062 as against 25,829 for the first quarter of 1923.

Since the first of the year 2505 trucks of all classes have been sold, with 986 for March, 871 for February, and 648 for January. Records available do not make comparison possible with the same months of last year.

GERMAN SHOW IN FALL

BERLIN, April 8 (*by mail*)—The German Automobile Manufacturers Association will hold another show at Berlin during the latter part of September next. Owing to the fact that its show building, which was erected in 1914, proved inadequate last year, it has been decided to erect an additional building across from the old one on the Kaiserdamm, which will double the available floor space.

Would Regulate Highway Use by Condition of Car

SAN FRANCISCO, April 23—A movement to grade all makes of motor vehicles according to age and condition, barring from the highways all that have been run a certain number of miles without replacement of certain parts, has been started by the California State Automobile Association through its magazine, *Motor Land*, which has just started discussion of the subject by asking the question, "How near the junk heap must a car be before it should be barred from the highways?"

This magazine continues to say that many experts are of the belief that "no driver can be safer than the car he drives" and that unsafe cars should be barred by law from the use of the highways.

The idea seems to be that committees of automotive engineers should be organized, with authority to grade all makes and models of cars and trucks on a basis of number of miles driven, present condition of car and character of replacements. On the findings of such committees a law should be based prohibiting the appearance on the highways of the State of cars deemed unsafe under the standards established by these engineers.

Use of Buses Gains in Southern States

ATLANTA, April 23—Due to the widespread development of motor bus transportation in the various southern States during the past year, several railroads are seeking the privilege of discontinuing some of their short line hauls, stating that the motor bus has made such serious inroads on the business of the railroads that short hauls are no longer profitable, but a dead loss to the railroads.

Principal development of the industry has been in the Florida territory, in the vicinity of Atlanta and in the eastern part of Tennessee, where there are approximately 50 per cent more buses in operation than a year ago.

In Florida it is now possible to make a tour of practically the entire State by motor bus, while the same is true of East Tennessee, with lines completely covering the Knoxville, Nashville and Chattanooga territory.

There are about 100 per cent more buses out of Atlanta than a year ago, with the entire adjacent territory covered for a distance of several miles, and retailers in the surrounding towns and cities using this means of transportation very largely in their dealings with Atlanta wholesalers and manufacturers.

It was during the first quarter of the present year that the bus industry has experienced its greatest development in the South, which is due to the several million dollars spent by southern States last year in the construction of new highways.